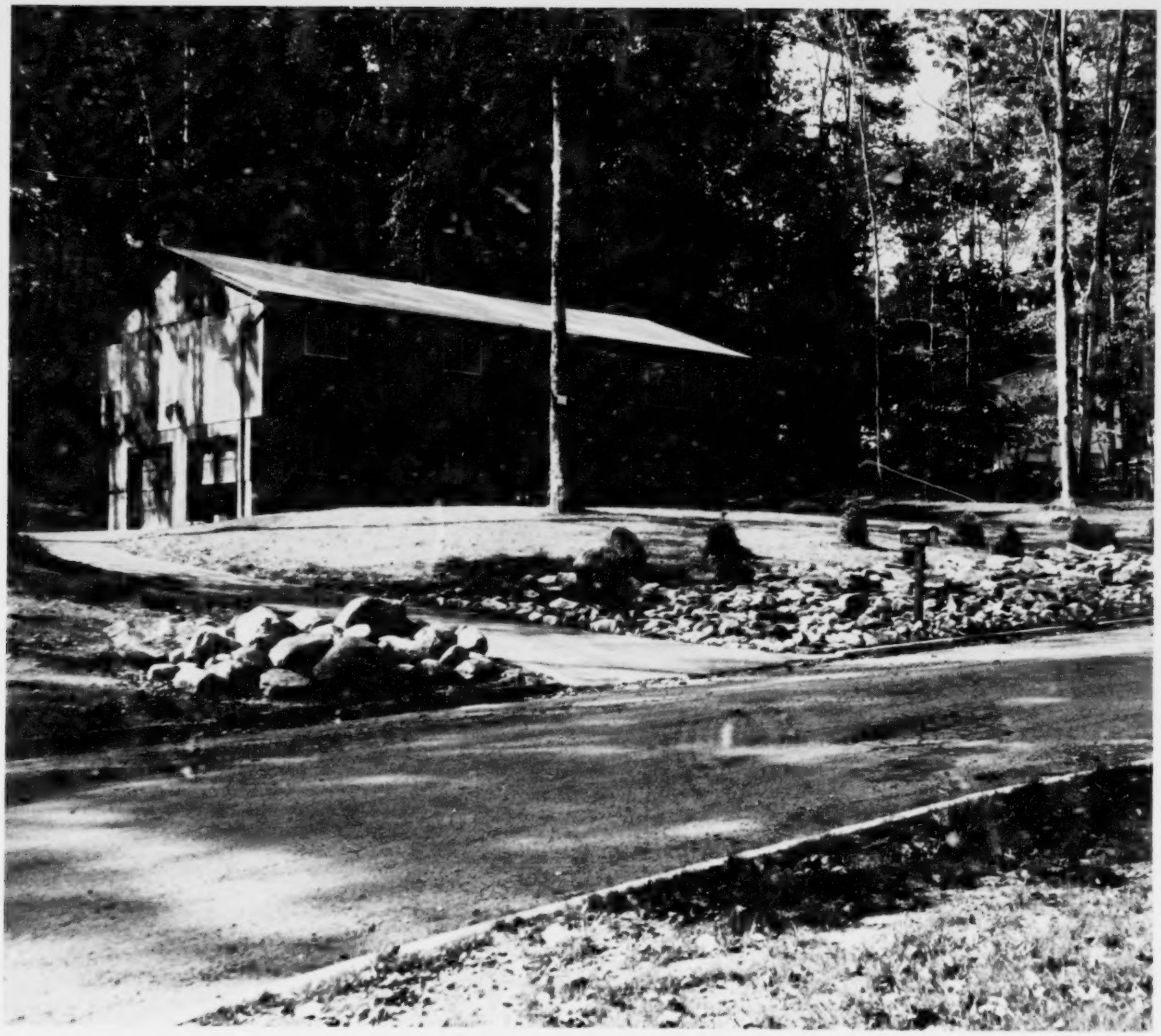
R59/5

United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Cornell University
Agricultural Experiment
Station

Soil Survey of Rockland County, New York



57.38:

pages tightly bound

best copy available

How To Use This Soil Survey

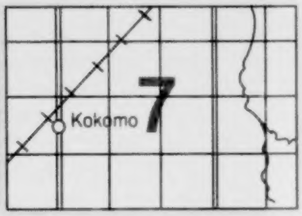
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

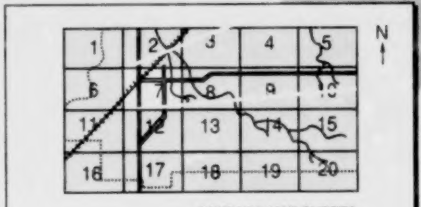
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



MAP SHEET

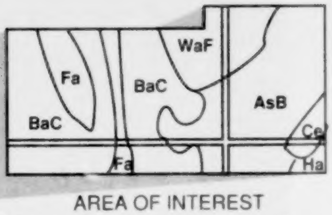
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.

MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station. It is part of the technical assistance furnished to the Rockland County Soil and Water Conservation District. Partial funding of this survey was provided by the Rockland County Legislature through the Rockland County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Urban development in an area of Wethersfield soils.

Contents

Index to map units ... iv
Summary of tables ... vi
Foreword ... ix
General nature of the county ... 1
How this survey was made ... 4
  Map unit composition ... 5
General soil map units ... 7
  Soil descriptions ... 7
Detailed soil map units ... 11
  Soil descriptions ... 12
Prime farmland ... 55
Use and management of the soils ... 57
  Crops and landscaping ... 57
  Woodland management and productivity ... 60
  Recreation ... 61
  Wildlife habitat ... 62
  Engineering ... 63
Soil properties ... 71
  Engineering index properties ... 71
  Physical and chemical properties ... 72
  Soil and water features ... 73
  Engineering properties of geologic deposits ... 74
Classification of the soils ... 77
Soil series and their morphology ... 77
  Adrian series ... 78
  Alden series ... 78
  Carlisle series ... 78
  Charlton series ... 79
  Chatfield series ... 79
  Cheshire series ... 80
  Fluvaquents ... 81
  Fredon series ... 81
  Haven series ... 81
  Hinckley series ... 82
  Hollis series ... 82
  Holyoke series ... 83
  Ipswich series ... 83
  Medisaprists ... 84
  Palms series ... 84
  Paxton series ... 85
  Rippowam series ... 85
  Riverhead series ... 86
  Sloan series ... 86
  Udorthents ... 87
  Wallington series ... 87
  Watchaug series ... 88
  Wethersfield series ... 88
  Yalesville series ... 89
Formation of the soils ... 91
  Factors of soil formation ... 91
  Processes of soil formation ... 92
References ... 95
Glossary ... 97
Tables ... 105

Issued October 1990

Index to Map Units

Aa—Adrian muck 12
Ad—Alden silt loam 12
Ca—Carlisle muck 13
CeB—Charlton fine sandy loam, 2 to 8 percent slopes 14
CeC—Charlton fine sandy loam, 8 to 15 percent slopes 14
CeD—Charlton fine sandy loam, 15 to 25 percent slopes 15
ChC—Charlton fine sandy loam, 2 to 15 percent slopes, very stony 15
ChE—Charlton fine sandy loam, 15 to 35 percent slopes, very stony 16
ChF—Charlton fine sandy loam, 35 to 50 percent slopes, very stony 17
CkC—Charlton-Rock outcrop complex, rolling 17
CkD—Charlton-Rock outcrop complex, hilly 18
CmB—Charlton-Urban land complex, 2 to 8 percent slopes 18
CmD—Charlton-Urban land complex, 15 to 25 percent slopes 19
CoC—Chatfield-Rock outcrop complex, rolling 19
CoD—Chatfield-Rock outcrop complex, hilly 20
CrB—Cheshire gravelly fine sandy loam, 2 to 8 percent slopes 21
CrC—Cheshire gravelly fine sandy loam, 8 to 15 percent slopes 21
CuB—Cheshire-Urban land complex, 2 to 8 percent slopes 22
CuC—Cheshire-Urban land complex, 8 to 15 percent slopes 22
Fh—Fluvaquents and Medisaprists, ponded 23
Fr—Fredon loam 23
HaA—Haven loam, 0 to 3 percent slopes 24
HaB—Haven loam, 3 to 8 percent slopes 25
HbB—Haven-Urban land complex, 0 to 8 percent slopes 25
HcA—Hinckley gravelly loamy sand, 0 to 3 percent slopes 26
HcB—Hinckley gravelly loamy sand, 3 to 8 percent slopes 26
HcC—Hinckley gravelly loamy sand, 8 to 15 percent slopes 27
HcD—Hinckley gravelly loamy sand, 15 to 25 percent slopes 27
HdB—Hinckley-Urban land complex, 0 to 8 percent slopes 28
HlF—Hollis-Rock outcrop complex, very steep 28
HoC—Holyoke-Rock outcrop complex, rolling 29
HoD—Holyoke-Rock outcrop complex, hilly 29
HoF—Holyoke-Rock outcrop complex, very steep 30
HuC—Holyoke-Urban land-Rock outcrop complex, rolling 30
Ip—Ipswich mucky peat 31
Pa—Palms muck 31
PnB—Paxton gravelly fine sandy loam, 2 to 8 percent slopes 32
PnC—Paxton gravelly fine sandy loam, 8 to 15 percent slopes 33
PsC—Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony 33
PsE—Paxton gravelly fine sandy loam, 15 to 35 percent slopes, very stony 34
Pt—Pits, gravel 35
Pv—Pits, quarry 35
Ra—Rippowam sandy loam 35
ReA—Riverhead fine sandy loam, 0 to 3 percent slopes 36
ReB—Riverhead fine sandy loam, 3 to 8 percent slopes 36
ReC—Riverhead fine sandy loam, 8 to 15 percent slopes 37
ReD—Riverhead fine sandy loam, 15 to 25 percent slopes 38
RuB—Riverhead-Urban land complex, 0 to 8 percent slopes 38
RuC—Riverhead-Urban land complex, 8 to 15 percent slopes 39
RuD—Riverhead-Urban land complex, 15 to 25 percent slopes 40
Sa—Sloan silt loam 41
Ur—Udorthents, refuse substratum 41

Us—Udorthents, smoothed 41
Uw—Udorthents, wet substratum 42
Ux—Urban land 42
Wa—Wallington silt loam 42
Wc—Watchaug fine sandy loam 43
WeA—Wethersfield gravelly silt loam, 0 to 3 percent slopes 43
WeB—Wethersfield gravelly silt loam, 3 to 8 percent slopes 44
WeC—Wethersfield gravelly silt loam, 8 to 15 percent slopes 45
WeD—Wethersfield gravelly silt loam, 15 to 25 percent slopes 45
WuB—Wethersfield-Urban land complex, 2 to 8 percent slopes 47
WuC—Wethersfield-Urban land complex, 8 to 15 percent slopes 48
WuD—Wethersfield-Urban land complex, 15 to 25 percent slopes 48
YaB—Yalesville sandy loam, 2 to 8 percent slopes .. 49
YaC—Yalesville sandy loam, 8 to 15 percent slopes 50
YaD—Yalesville sandy loam, 15 to 25 percent slopes 50
YuB—Yalesville-Urban land complex, 2 to 8 percent slopes 51
YuC—Yalesville-Urban land complex, 8 to 15 percent slopes 52
YuD—Yalesville-Urban land complex, 15 to 25 percent slopes 52

Index to Map Units

Aa—Adrian muck 12
Ad—Alden silt loam 12
Ca—Carlisle muck 13
CeB—Charlton fine sandy loam, 2 to 8 percent slopes 14
CeC—Charlton fine sandy loam, 8 to 15 percent slopes 14
CeD—Charlton fine sandy loam, 15 to 25 percent slopes 15
ChC—Charlton fine sandy loam, 2 to 15 percent slopes, very stony 15
ChE—Charlton fine sandy loam, 15 to 35 percent slopes, very stony 16
ChF—Charlton fine sandy loam, 35 to 50 percent slopes, very stony 17
CkC—Charlton-Rock outcrop complex, rolling 17
CkD—Charlton-Rock outcrop complex, hilly 18
CmB—Charlton-Urban land complex, 2 to 8 percent slopes 18
CmD—Charlton-Urban land complex, 15 to 25 percent slopes 19
CoC—Chatfield-Rock outcrop complex, rolling 19
CoD—Chatfield-Rock outcrop complex, hilly 20
CrB—Cheshire gravelly fine sandy loam, 2 to 8 percent slopes 21
CrC—Cheshire gravelly fine sandy loam, 8 to 15 percent slopes 21
CuB—Cheshire-Urban land complex, 2 to 8 percent slopes 22
CuC—Cheshire-Urban land complex, 8 to 15 percent slopes 22
Fh—Fluvaquents and Medisaprists, ponded 23
Fr—Fredon loam 23
HaA—Haven loam, 0 to 3 percent slopes 24
HaB—Haven loam, 3 to 8 percent slopes 25
HbB—Haven-Urban land complex, 0 to 8 percent slopes 25
HcA—Hinckley gravelly loamy sand, 0 to 3 percent slopes 26
HcB—Hinckley gravelly loamy sand, 3 to 8 percent slopes 26
HcC—Hinckley gravelly loamy sand, 8 to 15 percent slopes 27
HcD—Hinckley gravelly loamy sand, 15 to 25 percent slopes 27
HdB—Hinckley-Urban land complex, 0 to 8 percent slopes 28
HlF—Hollis-Rock outcrop complex, very steep 28
HoC—Holyoke-Rock outcrop complex, rolling 29
HoD—Holyoke-Rock outcrop complex, hilly 29
HoF—Holyoke-Rock outcrop complex, very steep 30
HuC—Holyoke-Urban land-Rock outcrop complex, rolling 30
Ip—Ipswich mucky peat 31
Pa—Palms muck 31
PnB—Paxton gravelly fine sandy loam, 2 to 8 percent slopes 32
PnC—Paxton gravelly fine sandy loam, 8 to 15 percent slopes 33
PsC—Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony 33
PsE—Paxton gravelly fine sandy loam, 15 to 35 percent slopes, very stony 34
Pt—Pits, gravel 35
Pv—Pits, quarry 35
Ra—Rippowam sandy loam 35
ReA—Riverhead fine sandy loam, 0 to 3 percent slopes 36
ReB—Riverhead fine sandy loam, 3 to 8 percent slopes 36
ReC—Riverhead fine sandy loam, 8 to 15 percent slopes 37
ReD—Riverhead fine sandy loam, 15 to 25 percent slopes 38
RuB—Riverhead-Urban land complex, 0 to 8 percent slopes 38
RuC—Riverhead-Urban land complex, 8 to 15 percent slopes 39
RuD—Riverhead-Urban land complex, 15 to 25 percent slopes 40
Sa—Sloan silt loam 41
Ur—Udorthents, refuse substratum 41

Us—Udorthents, smoothed 41
Uw—Udorthents, wet substratum 42
Ux—Urban land 42
Wa—Wallington silt loam 42
Wc—Watchaug fine sandy loam 43
WeA—Wethersfield gravelly silt loam, 0 to 3 percent slopes 43
WeB—Wethersfield gravelly silt loam, 3 to 8 percent slopes 44
WeC—Wethersfield gravelly silt loam, 8 to 15 percent slopes 45
WeD—Wethersfield gravelly silt loam, 15 to 25 percent slopes 45
WuB—Wethersfield-Urban land complex, 2 to 8 percent slopes 47
WuC—Wethersfield-Urban land complex, 8 to 15 percent slopes 48
WuD—Wethersfield-Urban land complex, 15 to 25 percent slopes 48
YaB—Yalesville sandy loam, 2 to 8 percent slopes 49
YaC—Yalesville sandy loam, 8 to 15 percent slopes 50
YaD—Yalesville sandy loam, 15 to 25 percent slopes 50
YuB—Yalesville-Urban land complex, 2 to 8 percent slopes 51
YuC—Yalesville-Urban land complex, 8 to 15 percent slopes 52
YuD—Yalesville-Urban land complex, 15 to 25 percent slopes 52

Summary of Tables

Temperature and precipitation (table 1) 106

Freeze dates in spring and fall (table 2) 107
Probability. Temperature.

Growing season (table 3) 107

Acreage and proportionate extent of the soils (table 4) 108
Acres. Percent.

Prime farmland (table 5) 110

Soil suitability for flowers, vegetables, and fruit (table 6) 111
Perennial flowers. Annual flowers and vegetables. Tree fruit and small fruit.

Soil suitability for ornamental trees, shrubs, and ground cover (table 7) 114
Deciduous trees. Evergreen trees. Deciduous shrubs and ground cover. Evergreen shrubs and ground cover.

Land capability classes and yields per acre of crops and pasture (table 8)... 120
Land capability. Grass-legume hay. Pasture.

Capability classes and subclasses (table 9) 124
Total acreage. Major management concerns.

Woodland management and productivity (table 10)......................... 125
Ordination symbol. Management concerns. Potential productivity. Trees to plant.

Recreational development (table 11)..................................... 130
Camp areas. Picnic areas. Playgrounds. Paths and trails. Golf fairways.

Wildlife habitat (table 12) 136
Potential for habitat elements. Potential as habitat for— Openland wildlife, Woodland wildlife, Wetland wildlife.

Building site development (table 13) 140
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets. Lawns and landscaping.

Sanitary facilities (table 14) 146
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 15) 152
Roadfill. Sand. Gravel. Topsoil.

Water management (table 16) 158
Limitations for—Pond reservoir areas; Embankments, dikes, and levees; Aquifer-fed excavated ponds. Features affecting—Drainage, Terraces and diversions, Grassed waterways.

Engineering index properties (table 17) 162
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Physical and chemical properties of the soils (table 18) 169
Depth. Clay. Moist bulk density. Permeability. Available water capacity. Soil reaction. Shrink-swell potential. Erosion factors. Organic matter.

Soil and water features (table 19) 173
Hydrologic group. Flooding. High water table. Bedrock. Potential frost action. Risk of corrosion.

Classification of the soils (table 20) 176
Family or higher taxonomic class.

Relationship between soil characteristics and parent material, landscape position, and drainage (table 21) 177

Foreword

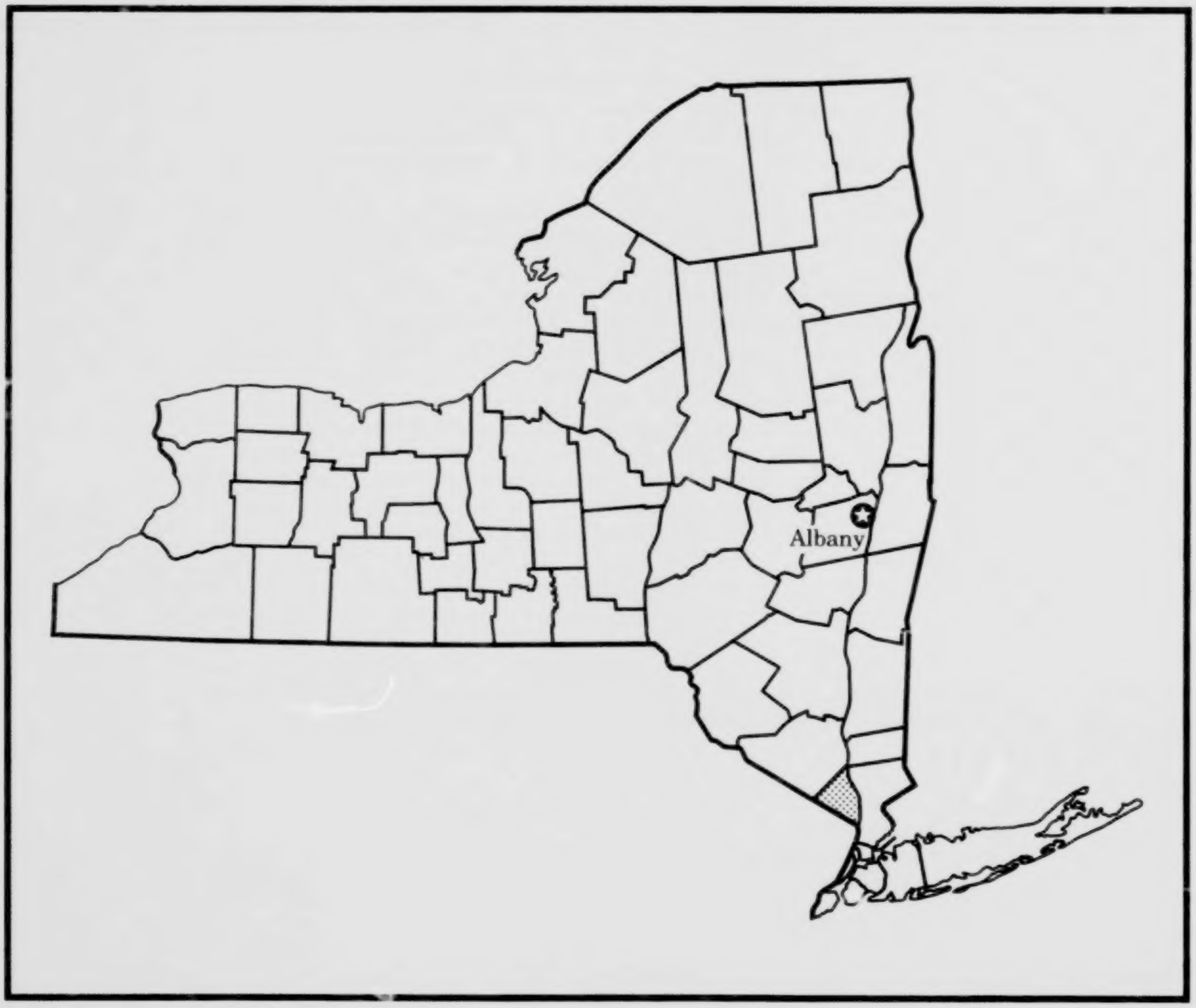
This soil survey contains information that can be used in land-planning programs in Rockland County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Paul A. Dodd
State Conservationist
Soil Conservation Service



Location of Rockland County in New York.

Soil Survey of
Rockland County, New York

By Stephen M. Bonnell, Soil Conservation Service

Fieldwork by Seymour D. Goodman, Charles J. Picarelli, and Mark Walsh,
Soil Conservation Service, and Gerald Rosenberg, Cornell University Agricultural
Experiment Station

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Cornell University Agricultural Experiment Station

ROCKLAND COUNTY is in southern New York, on the west bank of the Hudson River. The county is 113,920 acres, or 178 square miles. Its population in 1980 was 259,530 *(11)*. Most of the inhabitants live in the county's five towns and 15 villages. New City is the county seat *(7)*.

Farmland covers about 933 acres in the county *(5)*. The main farm products are vegetables, fruits and nuts, and nursery crops. Another 30,000 acres is parkland, and most of that is in the Palisades Interstate Park System.

General Nature of the County

This section provides information about Rockland County. It describes history and development, transportation, land use, drainage, water supply, physiography and geology, and climate.

History and Development

The earliest inhabitants of the county were the Algonquin Indians, who settled along the Shatemuc River, now known as the Hudson *(3)*. The Algonquins fished, hunted, and raised crops in the area.

In 1609, Henry Hudson sailed up the Shatemuc to an area near what is now Piermont. Permanent colonization began in 1675 in Nyack by the Dutch, and in 1683 the County of Orange, which included Rockland County, was formed. Rockland County was formed in 1798. Brick making, iron mining, and the production of steel and cotton products were some of the early major industries in the county.

The population of the county grew from 27,690 in 1880 to 45,500 in 1920 *(3)*. The completion of the highway systems and the shifts in population have led to further increases in the county's population; the 1980 census listed 259,530 people in Rockland County. Most of the development in the county has been in the southern and eastern parts. The ruggedness of the Ramapo Mountains has discouraged development in the western and northern parts.

Transportation

The New York State Thruway system services southern Rockland County, and U.S. Route 17 and the Palisades Interstate Parkway provide alternate routes to New York City and connections with the Garden State Parkway and the New Jersey Turnpike. U.S. Route 6 is a major east-west link between Rockland County and Putnam and Westchester Counties.

Rockland County is served by several of the major bus companies and three rail lines. Three major airports are within a 60-mile radius of the county, and the Ramapo Valley Airport provides facilities for air freight, private passenger airplanes, and helicopters.

The Hudson River provides Rockland County with a major water route for heavy freight. A number of the major industries in Rockland County have docking facilities on the river for barge freight. The various marinas and yacht clubs along the Hudson River provide facilities for small boats. A ferry service from New York City provides passenger service to Bear Mountain Park and further service up the Hudson River.

Land Use

In 1920, about half of the land area in Rockland County was used for farming *(7)*. The rest was in urban land or was otherwise unsuitable for farming. Most of the farmland was used for fruit and vegetables raised mainly for home use or local markets.

By about 1960, only about 6 percent of the land area was used for crops. Most of the rest was in urban areas or unmanaged woodland, and by 1973 about 30 percent of the land area was in public parks and recreation facilities.

The 1982 Census of Agriculture indicated that less than 1 percent of the total land area in the county was used for crops, mainly vegetables, fruits and nuts, and nursery products *(5)*.

Most of the urban development has been in the form of single-family dwellings on lots of about one-quarter acre, accompanied by shopping plazas and light industrial and commercial complexes.

Drainage

The streams in Rockland County are tributaries to the Hudson, Hackensack, and Passaic Rivers. In general, the streams that flow to the north and east discharge into the Hudson River; those that flow to the southwest discharge into the Passaic River; and those that flow to the south discharge into the Hackensack River.

The southern two-thirds of Rockland County is drained by tributaries of the Mahwah, Ramapo, and Hackensack Rivers. The eastern fringe drains directly into the Hudson River. In the northern portion, the Minisceongo and Cedar Pond tributaries drain the major portion of the land area and flow into the Hudson *(6)*.

The Hudson River, which forms the boundary between Rockland County and Westchester County, is the largest stream in the area. The river is estuarine, and the water level in the vicinity of Rockland County has a normal tidal range of about 3 feet. The depth of the river is generally less than 15 feet, but in the main channel in the northern part of the county it is more than 100 feet in several places. The Hudson Valley is narrow at the northern and southern ends of the county and is widest opposite Haverstraw.

Other rivers in the county include the Hackensack, Ramapo, and Mahwah Rivers. The Hackensack drains an area of about 48 square miles in eastern Rockland County. The discharge from the northern part of the watershed drains into the Lake DeForest Reservoir. The Ramapo enters the county near Sloatsburg and flows southeast through the Ramapo Mountains to Suffern where it crosses the state line and flows southwest into New Jersey. The Mahwah flows southwest along the contact between the rocks of Precambrian age and those of Triassic age. It discharges into the Ramapo River at Mahwah, New Jersey.

Water Supply

The main water sources in the county are reservoirs along the Hackensack River, the largest of which are DeForest Lake and Lake Tappan, which crosses the New York-New Jersey state line. The county used an average of 29.5 million gallons per day in 1980.

Some areas are supplied by drilled wells, and a few individual community wells in the Mahwah River flood plain serve the village of Suffern. The reservoirs in the Ramapo Mountain provide water storage for the Sloatsburg area.

The southern and eastern sections of Rockland County are underlain by a sandstone formation that is the principal aquifer for the county. The northern mountainous section is underlain by crystalline rocks, such as granite, gneiss, and schist. This area generally has low-yielding wells suitable mostly for domestic use, and the yields of wells in the valleys generally are higher than those on the hills. There are two main reasons for this. First, the valleys commonly are formed along fault zones or where the rock contains numerous joints. Second, many valleys contain permeable glacial deposits that act as a reservoir, and some transmit substantial quantities of water to underlying rocks *(6)*.

Physiography and Geology

By Bernard S. Ellis, geologist, Soil Conservation Service.

Rockland County is in the southeast corner of New York State, just north of New York City. It is in two parts of the New England province. The eastern two-thirds is in the Triassic Lowlands, and the western third is in the Reading Prong.

The New England uplands are a geologically complex area that exhibit moderate relief. Landforms in the area show a strong correlation with the relative

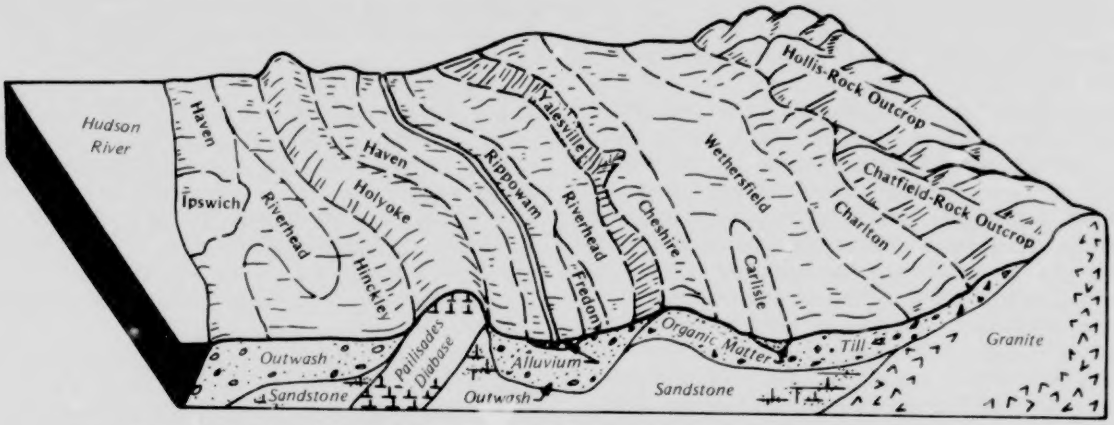


Figure 1.—Relationship between soils, landscape position, and parent materials in Rockland County.

hardness of the underlying bedrock. The Triassic Lowlands are characterized topographically by broad, gentle valleys and only a moderate pattern of ridges. Elevations range from 200 to 500 feet above sea level in the eastern part of the county to more than 1,000 feet in the Ramapo and Hudson highlands. These highlands trend from the southwest corner of the county to the northeast corner.

The northwestern part of the county generally is underlain by a heavily metamorphosed complex of Precambrian and Paleozoic sedimentary and igneous rocks. The outcrops generally are granite, gneiss, and schist. Hollis is an example of a soil that formed over these rocks. A younger, unmetamorphosed section of conglomerate-sandstone-siltstone roadbeds that are Triassic in age is in the central and southern parts of the county. Cheshire and Wethersfield soils are common in areas of these formations. Basalt and diabase igneous rocks form the cliffs of the Hudson River Palisades. Holyoke is an example of a soil that formed over these rocks. The geologic map at the back of this survey shows the rock formations throughout the county. Figure 1 shows the relationship between the soils and geology in the county.

The basic pattern of hills and valleys reflects the structure and variation in composition of the underlying bedrock. Streams tend to follow the softer, more easily eroded rock units and zones that were more intensively fractured or faulted. This topographic pattern has been further modified by the intensive erosion of the continental glaciers that moved southward as far as Long Island and northern New Jersey. As the glaciers melted and retreated, they left a complex sedimentary covering of moraines, terraces, outwash plains, lakes, and marshes. An exception to this ridge and valley topography is the area underlain by the Triassic redbeds in Rockland County. In this area shale and sandstone overlie the diabase sill that forms the Palisades. A north-south escarpment developed on the sill and forms the west bank of the Hudson River as far south as Staten Island.

Initially, the glacial ice moved down over the area, scouring and eroding the bedrock surface. Glacial till, a mixture of gravel, sand, silt, and clay, was deposited under the ice and in some areas in front of the ice face. Charlton and Wethersfield are two of the major soils that formed in till. As the glacial ice stagnated and the ice front retreated, glacial meltwater deposited stratified gravel and sand in many areas, especially in the major valleys. Riverhead soils are dominant in these areas of outwash deposits. The meltwater formed glacial lakes in low areas. Silts and clays dominate the deposits in these lakes. Wallington soils formed in these deposits. The glacial deposits are thickest in the Hudson River Valley. They are more than 500 feet thick in places.

Alluvial deposits are of minor extent in Rockland County. Rippowam soils are the most commonly alluvial soils in the county.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina

Table 1 gives data on temperature and precipitation for the survey area as recorded at Suffern, New York, in the period 1956 to 1982. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred at Suffern on January 22, 1961, is -16 degrees. In summer the average temperature is 70 degrees, and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred at Suffern on July 4, 1966, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 47 inches. Of this, more than 25 inches, or about 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 8.40 inches at Suffern on August 28, 1971. Thunderstorms occur on about 27 days each year.

The average seasonal snowfall is nearly 26 inches. The greatest snow depth at any one time during the period of record was 7 inches. On the average, 1 day of the year has at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 11 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material has few or no roots or other living organisms and has been changed very little by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

There are areas along the borders of Rockland County where boundaries on the map and names of the map units do not match those of adjoining counties. These differences exist because of differences in the detail of mapping, changes in soil classification, and differing proportions of the same soils in adjoining counties. In some instances, adjoining counties match with similar kinds of soils. In most instances, the adjoining counties contain at least one of the named soils.

The match of the general soil map with Bergen County and Passiac County, New Jersey, joins from east to west as follows: unit 2, Holyoke-Wethersfield-Rock outcrop, joins with Wethersfield-Rock outcrop in Bergen County; unit 4, Riverhead-Hinckley-Carlisle, joins with Dunnellen-Riverhead-Urban land in Bergen County; unit 5, Wethersfield-Cheshire-Urban land, joins with Wethersfield-Urban land in Bergen County; and unit 6, Paxton-Chatfield-Rock outcrop, joins with Rockaway-Rock outcrop in Bergen County and with Rockaway-Rock outcrop-Hibernia in Passaic County.

The match of the general soil map with Orange County joins from northeast to southwest as follows: unit 1, Chatfield-Charlton-Hollis-Rock outcrop, joins with Hollis-Rock outcrop in Orange County, and unit 6, Paxton-Chatfield-Rock outcrop, joins in Orange County with Arnot-Swartswood-Hollis and a narrow delineation of Mardin-Erie.

Soil Descriptions

1. Chatfield-Charlton-Hollis-Rock Outcrop

Dominantly gently sloping to very steep, somewhat excessively drained and well drained soils that are very deep, moderately deep, and shallow over schist, granite, or gneiss; and areas of Rock outcrop; on uplands

This unit consists of side slopes, valley sides, and hilltops on mountainous uplands. The relief has been influenced by the underlying bedrock. The underlying crystalline bedrock and the Rock outcrop are dominantly schist, gneiss, and granite. The slope is mainly 8 to 25 percent but ranges from 2 to 60 percent.

This unit makes up about 29 percent of the county. The unit is about 30 percent Chatfield soils, 30 percent Charlton soils, 10 percent Hollis soils, and 10 percent Rock outcrop. The remaining 20 percent is soils of minor extent.

Chatfield soils are moderately deep and are well drained and somewhat excessively drained. Permeability throughout is moderate or moderately rapid. The water table is at a depth of more than 6 feet. Chatfield soils are mainly on hillsides and valley sides.

Charlton soils are very deep and well drained. They are on glacially modified uplands. Permeability throughout is moderate and moderately rapid. The depth to the water table is more than 6 feet.

Hollis soils are shallow and are somewhat excessively drained and well drained. Permeability throughout is moderate or moderately rapid. The depth to the water table is more than 6 feet. Hollis soils are on valley sides.

Rock outcrop appears as ledges on side slopes and as angular and pointed blocks on ridgecrests and hilltops. Some areas have a stairstep appearance as a series of ledges. Rock outcrop is dominantly crystalline schist, gneiss, and granite. Vegetation is nonexistent or is sparse mosses and small shrubs rooted in fractures and joints.

Of minor extent in this unit and adjacent to the rock outcrops are soils that are less than 10 inches deep to bedrock. Also of minor extent are Paxton, Alden, and Palms soils; Fluvaquents and Medisaprists; and soils on the lower parts of valley sides that have an extremely stony surface.

Most areas of this unit are forested and provide habitat for wildlife. Slopes, a severe erosion hazard, droughtiness, and shallowness to bedrock are the main limitations of the unit for farming. The limitations for community development are shallowness to bedrock, rock outcrops, surface stones, and slopes.

2. Holyoke-Wethersfield-Rock Outcrop

Dominantly rolling to very steep, somewhat excessively drained and well drained soils that are shallow and very deep over basalt, red sandstone, or shale; and areas of Rock outcrop; on uplands

This unit consists of hilltops and valley sides containing exposures of Rock outcrop. Slopes are dominantly 8 to 35 percent but range from 5 to 50 percent.

This unit makes up about 8 percent of the county. The unit is about 50 percent Holyoke soils, 15 percent Wethersfield soils, and 10 percent Rock outcrop. The remaining 25 percent is soils of minor extent.

Holyoke soils are 10 to 20 inches deep to basalt or red sandstone bedrock. They are well drained to somewhat excessively drained. The water table is at a depth of more than 6 feet. Permeability is moderate throughout. Holyoke soils are on the sides of hills and ridges.

Wethersfield soils are very deep and well drained. They have a dense substratum. Permeability is moderate in the upper part and slow or very slow in the lower part. The water table commonly is perched above the substratum at a depth of 1.5 to 2.5 feet from February to April. Wethersfield soils are on ridgetops and the sides of ridges.

Rock outcrop appears as ledges on side slopes and as angular and pointed blocks on ridgecrests and hilltops. Some areas have a stairstep appearance as a series of ledges. Rock outcrop is dominantly basalt, red sandstone, conglomerate, or shale. Vegetation is nonexistent or is sparse mosses and small shrubs rooted in fractures and joints.

Of minor extent in this unit are areas of Cheshire, Yalesville, and Watchaug soils and many rock quarries.

This unit is mostly forested. It provides habitat for wildlife and is used for recreation. Slopes and shallowness to bedrock are the main limitations of the unit for community development. Slopes, surface stones, and shallowness to bedrock are limitations for farming.

3. Udorthents-Ipswich

Nearly level and gently sloping, somewhat excessively drained to moderately well drained and very poorly drained soils formed in mixed material or organic material; along the Hudson River

This unit makes up about 2 percent of the county. The unit is about 50 percent Udorthents, 30 percent Ipswich soils, and 20 percent soils of minor extent. Slopes are dominantly 0 to 3 percent but are as much as 8 percent in some areas.

Udorthents consist of somewhat excessively drained to moderately well drained soils in areas that have been cut, filled, or dredged. Some areas are landings and industrial sites along the Hudson River.

Ipswich soils are nearly level and very poorly drained and are subject to daily inundation by tides. They are in tidal marsh areas. Permeability throughout ranges from moderate to rapid. The water table for most of the year is between 1 foot below the surface and 1 foot above the surface.

Of minor extent in this unit are areas of Urban land and Wethersfield and Hinckley soils.

The areas of Ipswich soils have good potential for wetland wildlife habitat. The Udorthents areas are so variable that onsite investigations are required to determine their suitability for any use.

4. Riverhead-Hinckley-Carlisle

Very deep, nearly level to moderately steep, excessively drained to well drained soils on outwash plains and terraces; very deep, nearly level, very poorly drained soils in bogs and depressions

This unit consists of a series of terraces, rolling knolls, ridges, and depressions. The slope is mainly 0 to 8 percent but in some areas is as much as 25 percent.

This unit makes up about 8 percent of the survey area. The unit is about 20 percent Riverhead soils, 20 percent Hinckley soils, 10 percent Carlisle soils, and 50 percent soils of minor extent.

Riverhead soils are nearly level to moderately steep and are well drained. They are on terraces, low hills, and ridges. Permeability is moderately rapid in the upper part of the soil and very rapid in the lower part. The depth to the water table is more than 6 feet.

Hinckley soils are nearly level to moderately steep and are excessively drained. They are on the sides and top of stream terraces and on terraced hillsides. Permeability is rapid in the upper part of the soil and very rapid in the lower part. The depth to the water table is more than 6 feet.

Carlisle soils are nearly level and very poorly drained. They are in broad depressional swamps and bogs that are ponded for much of the year. Permeability throughout is moderately slow to moderately rapid. The water table is at or above the surface most of the year.

Of minor extent are areas of urban land and Udorthents; Haven, Fredon, Rippowam, and Palms soils; and Fluvaquents and Medisaprists.

This unit is mostly wooded, but some areas are in urban development. Poor drainage and the high water table are major limitations of the Carlisle soils for community development.

5. Wethersfield-Cheshire-Urban Land

Very deep, nearly level to moderately steep, well drained soils formed in acid glacial till derived from reddish sandstone on till plains; areas of Urban land

This unit consists of upland ridges and urbanized areas and makes up about 50 percent of the county. The unit is about 50 percent Wethersfield soils, 10 percent Cheshire soils, and 10 percent Urban land. The remaining 30 percent is minor soils.

Wethersfield soils are on ridgetops and the sides of ridges on uplands. Permeability is moderate in the upper part and slow or very slow in the lower part. The water table commonly is perched at a depth of 1.5 to 2.5 feet from February to April.

Cheshire soils are mainly on ridgetops. Permeability throughout is moderate or moderately rapid. The depth to the water table is more than 6 feet.

Urban land consists of buildings, roads, driveways, parking lots, and other impervious structures. It is throughout the unit.

Of minor extent in this unit are areas of Yalesville, Watchaug, and Alden soils and areas of Udorthents.

Many areas of this unit are used for community development. Some areas are farmed. Some other areas are forested or idle. Slope is the main limitation for community development.

6. Paxton-Chatfield-Rock Outcrop

Dominantly gently sloping to steep, somewhat excessively drained and well drained soils that are very deep and moderately deep over schist, gneiss, or granite; areas of Rock outcrop; on uplands

This unit consists of side slopes, valley sides, and hilltops on mountainous uplands whose topography is influenced by the underlying bedrock. The slope is mainly 8 to 25 percent but ranges from 2 to 35 percent.

This unit makes up about 3 percent of the county. The unit is about 35 percent Paxton soils, 30 percent Chatfield soils, 10 percent Rock outcrop, and 25 percent soils of minor extent.

Paxton soils are very deep and well drained. They are mainly on top of hills and ridges. Permeability is moderate in the upper part and slow or very slow in the lower part. The water table is perched at a depth of 1.5 to 2.5 feet from February to April.

Chatfield soils are moderately deep and are well drained to somewhat excessively drained. They are 20 to 40 inches deep to bedrock. Permeability throughout is moderate or moderately rapid. The water table is at a depth of more than 6 feet.

Rock outcrop is ledges on side slopes and angular and pointed blocks on ridgecrests and hilltops. Some areas have a stairstep appearance as a series of ledges. Vegetation is nonexistent or is sparse mosses and small shrubs rooted in fractures and joints.

Of minor extent are areas of Charlton, Alden, Hollis, and Palms soils and soils with an extremely stony surface mainly at the lower part of the slope.

This unit is mostly wooded. Some areas are in urban development. Slope and the rock outcrop are the main limitations for community development and, along with stones on the surface, are limitations for farming.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Yalesville sandy loam, 8 to 15 percent slopes, is a phase of the Yalesville series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Hollis-Rock outcrop complex, very steep, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Fluvaquents and Medisaprists, ponded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarry, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

In some areas along the borders of Rockland County the boundaries on the soil maps do not match those of adjoining counties. These discrepancies exist because of differences in mapping scales and changes in soil classification. Where discrepancies exist, adjoining counties match with similar kinds of soils.

The match of the detailed soil maps with adjoining published surveys is as follows:

Orange County, New York.—The same or similar soils match across the county line. In the southwest corner of the county, Paxton soils, which have a dense substratum, were correlated in Rockland County. They match with Swartswood soils in Orange County, which have a fragipan. These soils have similar interpretations for use and management. Other minor mismatches are the result of different legend design in the two counties. In such cases, similar soils having similar slopes match across county lines.

Passaic and Bergen Counties, New Jersey.—The same or similar soils match across the county lines. In Passaic County, near the western corner of Rockland County, Rockaway soils were correlated. They join Paxton soils in Rockland County. Rockaway soils have a fragipan, while Paxton soils have a dense substratum. Both soils formed in similar parent materials and have similar interpretations for most uses. They are considered an acceptable join. In places along the county lines of both New Jersey counties, soil units join soil-urban units. This difference is due to differences in land use and zoning ordinances between New York and New Jersey. Other minor mismatches are the result of differences in legend design or the occurrence of different soils in the three adjoining counties. In such cases, similar soils, having similar slopes, join across the county lines.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

Aa—Adrian muck. This soil is very deep, nearly level, and very poorly drained. It is in depressional areas of outwash plains. The areas are commonly oblong and range mainly from 5 to 50 acres. Slopes range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches, black muck

Subsurface layer:
6 to 26 inches, dark reddish brown muck

Substratum:
26 to 60 inches, grayish brown loamy coarse sand

Included with this soil in mapping are small areas of Carlisle and Palms soils mixed together throughout the unit. A thin mineral layer is at the surface of a few areas of this Adrian soil. Included areas are up to 5 acres each and make up about 10 to 25 percent of the unit.

Major soil properties—

Permeability: moderately slow to moderately rapid in the surface and subsurface layers and rapid in the substratum
Available water capacity: very high
Soil reaction: strongly acid to mildly alkaline in the surface and subsurface layers and moderately acid to moderately alkaline in the substratum
Surface runoff: ponded
Erosion hazard: severe by wind
Depth to the water table: 1 foot above the surface to 1 foot below the surface (November to May)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered with water-tolerant grasses and shrubs.

Dwellings.—Subsidence, ponding, and low strength are the main limitations of the soil as a site for dwellings. The included soils also have limitations for dwellings. Some nearby mineral soils that are higher on the landscape and better drained, such as Riverhead and Charlton soils, are more suitable for dwellings.

Local roads and streets.—Subsidence, ponding, and frost action are the main limitations of the soil as a site for local roads and streets. Some nearby soils, such as Riverhead soils, also are limited by frost action but are more suitable than this Adrian soil.

Septic tank absorption fields.—Prolonged periods of wetness, water on the surface, subsidence, and slow percolation are the main limitations of the soil as a site for most types of septic tank absorption fields. Poor filtering is common, and contamination of the ground water is a hazard. Most of the included soils have similiar limitations, but some of the Charlton soils on adjacent uplands are generally suitable as sites for septic tank absorption fields.

Recreation.—Ponding for prolonged periods and the organic material in the upper part of the soil are the main limitations for recreation development. The ponding makes many areas inaccessible for much of the year. The organic material does not support heavy traffic.

Woodland.—The potential productivity of this soil for silver maple is moderate. The water table causes severe seedling mortality and restricts rooting, making windthrow a hazard. The surface layer is soft when wet and generally does not support heavy equipment.

Capability classification: Vw.

Ad—Alden silt loam. This soil is deep, nearly level, and very poorly drained. It is in broad drainageways or depressional areas of dissected till plains and in depressional areas of bedrock-controlled uplands. The areas are commonly oblong and range mainly from 5 to 20 acres. Slopes are less than 1 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, black silt loam

Subsoil:
9 to 33 inches, dark gray silt loam and yellowish brown mottles

Substratum:
33 to 60 inches, brown loam and yellowish brown mottles

Included with this soil in mapping are small areas of Adrian, Sloan, and Rippowam soils. Adrian soils are ponded most of the time and have a thick organic surface layer. Also included are areas of Alden soils that have stones at the surface. Included soils make up about 10 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer, moderately slow in the subsoil, and slow or moderately slow in the substratum
Available water capacity: high
Soil reaction: strongly acid to neutral in the surface layer, moderately acid to neutral in the subsoil, and slightly acid to moderately alkaline in the substratum
Surface runoff: slow or ponded
Erosion hazard: none to slight
Depth to the water table: 1 foot above the surface to 6 inches below the surface (November to June)
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are wooded. Some are in grasses and sedges.

Dwellings.—Prolonged periods of wetness and water commonly at or above the surface are the major limitations. The common inclusions in the unit have limitations that are as severe as those in this Alden soil. Some adjacent soils on higher uplands, such as Charlton and Wethersfield soils, have fewer, less severe limitations for dwellings.

Local roads and streets.—Frost action and the prolonged periods with water at or on the surface are the major limitations.

Septic tank absorption fields.—Slow percolation and prolonged periods of wetness are the major limitations. Some adjacent areas of Charlton soils on higher uplands are better drained and thus less limited for conventional septic systems.

Recreation.—The prolonged periods in which water is at or on the surface and the organic material in the soil are the main limitations. The water on the soil during much of the year reduces accessibility. The organic material in the soil is soft, especially when wet, and does not support heavy traffic.

Woodland.—The potential productivity of this soil for red maple is moderate. The shallow water table causes high seedling mortality and restricts rooting, making windthrow a severe hazard. The water table also makes the surface layer soft and unsuitable for supporting heavy equipment.

Capability classification: IVw.

Ca—Carlisle muck. This soil is very deep, nearly level, and very poorly drained. It is in broad, depressional or basin-like swamps and bogs that have water on the surface for extensive periods. The areas range from 5 to 300 acres and are oval or rectangular. Small perennial streams either bisect or run along the edge of this unit. Slopes are less than 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 11 inches, black muck

Subsurface layer:
11 to 80 inches, black muck

Included with this soil in mapping are small areas of Adrian and Palms soils mainly near the edges of the unit. Also included are small areas of Alden and Sloan soils on the higher parts of the unit. Included areas are up to 5 acres each and make up about 10 to 25 percent of the unit.

Major soil properties—

Permeability: moderately slow to moderately rapid throughout
Available water capacity: very high
Soil reaction: very strongly acid to neutral throughout
Surface runoff: ponded
Erosion hazard: subject to wind erosion
Depth to the water table: 6 inches above the surface to 1 foot below the surface (September to June)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered with water-tolerant grasses and shrubs.

Dwellings.—Subsidence, ponding, and low strength are the main limitations. The included soils also have limitations for dwellings. Some nearby soils that are higher on the landscape and better drained, such as Riverhead and Charlton soils, are more suitable than this Carlisle soil.

Local roads and streets.—Subsidence, ponding, and frost action are the main limitations. Some nearby soils, such as Riverhead soils, are limited by frost action but are more suitable than this Carlisle soil.

Septic tank absorption fields.—Prolonged periods of wetness, water at or on the surface, subsidence, and slow percolation are the main limitations. Poor filtering is common, and ground-water pollution is a hazard. The common inclusions in the unit also have limitations. Some soils on adjacent uplands, such as Charlton soils, are better suited to septic tank absorption fields.

Recreation.—The prolonged periods in which water is at or on the surface and the organic material in the soil are the main limitations. The water on the soil during much of the year reduces accessibility. The organic material in the soil is soft, especially when wet, and does not support heavy traffic.

Woodland.—The potential productivity of this soil for red maple is moderate. The shallow water table causes high seedling mortality and restricts rooting, making windthrow a severe hazard. The water table also makes the surface layer soft and unsuitable for supporting heavy equipment.

Capability classification: Vw.

CeB—Charlton fine sandy loam, 2 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is on hilltops on uplands. The areas range from 10 to 300 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are near steeper slopes and rock outcrops. The Watchaug soils are in depressional areas and drainageways. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland and grassland in public parks. Some areas are used for community development. This soil is classified as prime farmland.

Dwellings, roads and streets, and septic tanks.—This soil has few or no limitations for these uses.

Recreation.—Slope and small stones in and on the soil are the main limitations. Grading reduces the slope, and a sandy fill material will cover the stones.

Hay and pasture.—This soil is well suited to hay and pasture. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for red oak is moderate. The soil has few or no limitations for woodland management.

Capability classification: IIe.

CeC—Charlton fine sandy loam, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and well drained. It is on hilltops and hillsides on uplands. The areas range from 5 to 200 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are near steeper slopes and rock outcrops. The Watchaug soils are in depressional areas and drainageways. Also included are areas of Charlton soils that have stones on the surface. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout

Surface runoff: rapid
Erosion hazard: medium
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are in woodland. Some areas are in woodland and grassland in public parks. Some areas are used for community development.

Dwellings, roads and streets, septic tanks, and recreation.—Slope is the main limitation of this soil for these uses. Land shaping and grading will help to overcome the limitation in most areas, as will designing buildings and roads and streets to conform to the contour of the slope. Drop boxes or other structures that ensure even distribution of effluent are suitable for septic tank absorption fields.

Hay and pasture.—This soil is well suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for red oak is moderate. The soil has few or no limitations for woodland management.

Capability classification: IIIe.

CeD—Charlton fine sandy loam, 15 to 25 percent slopes. This soil is very deep, moderately steep, and well drained. It is on the sides of hills and valleys on uplands. The areas range from 10 to 150 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are near steeper slopes and rock outcrops. The Watchaug soils are in depressional areas and drainageways. Also included are areas of Charlton soils that have stones on the surface and areas along the sides of valleys that have rock outcrops at the surface. Included areas are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Dwellings, roads and streets, septic tanks, and recreation.—Slope is the main limitation of this soil for these uses. Land shaping and grading will help to overcome the limitation in most areas, as will designing buildings and roads and streets to conform to the contour of the slope. Maintaining the plant cover at construction sites, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help control erosion at building sites. Drop boxes or other structures that ensure even distribution of effluent are suitable for septic tank absorption fields.

Hay and pasture.—This soil is moderately suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for red oak is moderate. Erosion is a hazard, and slope limits the use of equipment.

Capability classification: IVe.

ChC—Charlton fine sandy loam, 2 to 15 percent slopes, very stony. This soil is very deep, gently sloping to strongly sloping, and well drained. It is at the foot of mountain slopes. Stones up to 24 inches in diameter cover from less than 1 percent to 3 percent of the surface. The areas of this soil range mainly from 10 to 100 acres and are irregular in shape.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are commonly in areas near rock outcrops and steeper slopes. The Watchaug soils are in depressional areas and drainageways. Also included are areas of Charlton soils that do not have stones at the surface and soils that are shallow or moderately deep to bedrock. Included areas are up to 5 acres each and make up about 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland or grassland in public parks. Some areas are used for community development.

Dwellings, roads and streets, septic tanks, and recreation.—Slope is the main limitation of this soil for these uses. Land shaping and grading will help to overcome the limitation in most areas, as will designing buildings and roads and streets to conform to the contour of the slope. The stones on the surface are an additional limitation for recreation. Maintaining the plant cover at construction sites, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help control erosion at building sites. Drop boxes or other structures that ensure even distribution of effluent are suitable for septic tank absorption fields.

Hay and pasture.—This soil is poorly suited to hay and pasture. The stones on the surface are a limitation, and erosion is a hazard if the pasture is overgrazed. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for red oak is moderate. Erosion is a hazard, and slope limits the use of equipment.

Capability classification: VIs.

ChE—Charlton fine sandy loam, 15 to 35 percent slopes, very stony. This soil is very deep, moderately steep and steep, and well drained. It is at the foot of mountain slopes. Stones up to 24 inches in diameter cover from less than 1 percent to 3 percent of the surface. The areas of this soil range mainly from 5 to 75 acres and are irregular in shape.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are commonly in areas near rock outcrops and steeper slopes. The Watchaug soils are in depressional areas and drainageways. Also included are areas of Charlton soils that do not have stones at the surface and soils that are shallow or moderately deep to bedrock. Included areas are up to 5 acres each and make up about 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland or grassland in public parks.

Dwellings, roads and streets, septic tanks, and recreation.—Slope is the main limitation of this soil for these uses. Some of the less sloping areas of included Charlton soils have better suitability for these uses. Land shaping and grading and special design will help to overcome the limitation for roads and streets. The stones on the surface are an additional limitation for recreation.

Woodland.—The potential productivity of this soil for red oak is moderate. Erosion is a hazard, and slope limits the use of equipment.

Capability classification: VIIs.

ChF—Charlton fine sandy loam, 35 to 50 percent slopes, very stony. This soil is very deep, very steep, and well drained. It is at the foot of mountain slopes and on valley sides. Stones up to 24 inches in diameter cover from less than 1 percent to 3 percent of the surface. The areas of this soil range mainly from 5 to 75 acres and are irregular in shape.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this soil in mapping are small areas of Paxton, Hollis, and Watchaug soils. The Paxton soils are throughout the unit. The Hollis soils are commonly in areas near rock outcrops and steeper slopes. The Watchaug soils are in depressional areas and drainageways. Also included are areas of Charlton soils that do not have stones at the surface and soils that are shallow or moderately deep to bedrock. Included areas are up to 5 acres each and make up about 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland or grassland in public parks.

Dwellings, roads and streets, septic tanks, and recreation.—Slope is the main limitation of this soil for these uses. Some of the less sloping areas of included Charlton soils have better suitability for these uses. Land shaping and grading and special design will help to overcome the limitation for roads and streets. The stones on the surface are an additional limitation for recreation.

Woodland.—The potential productivity of this soil for red oak is moderate. Erosion is a hazard, and slope limits the use of equipment.

Capability classification: VIIs.

CkC—Charlton-Rock outcrop complex, rolling. This unit is on hillsides on bedrock-controlled uplands. It consists of very deep, well drained, strongly sloping Charlton soils and areas of exposed bedrock that appear mainly as ledges. The unit consists of about 60 percent Charlton soils, 15 percent rock outcrop, and 25 percent other soils. The Charlton soils and rock outcrop are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or long and narrow and range from 10 to 300 acres. Slope ranges from 5 to 15 percent.

The typical sequence, depth, and composition of the layers of the Charlton soils are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this unit in mapping are small areas of Paxton, Chatfield, Hollis, and Watchaug soils. The Paxton soils are throughout the unit and have a dense substratum. The Chatfield and Hollis soils are commonly on shoulder slopes, on ridgetops, and near rock outcrops. The Watchaug soils are along drainageways and in depressional areas. They are moderately well drained. The areas of included soils are as much as 5 acres each.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland in public parks. Some areas are used for community development.

Dwellings, septic tanks, roads and streets, and recreation.—Slope and the areas of exposed bedrock are the main limitations. Land shaping and grading will help overcome the slope. Drop boxes or other structures will help increase the efficiency of septic systems. Maintaining a plant cover during construction and quickly establishing a plant cover after construction will help control erosion at building sites.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The Charlton soils have few or no limitations for woodland management.

Hay and pasture.—This unit is poorly suited to hay and pasture because of the areas of exposed bedrock. Erosion is a hazard if overgrazing occurs. Proper stocking rates, deferred grazing, fertilizer, and weed control will help increase forage yields.

Capability classification: VIs.

CkD—Charlton-Rock outcrop complex, hilly. This unit is on hillsides on bedrock-controlled uplands. It consists of very deep, well drained Charlton soils and areas of exposed bedrock that appear as ledges. The unit consists of about 50 percent Charlton soils, 25 percent rock outcrop, and 25 percent other soils. The Charlton soils and rock outcrop are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or long and narrow and range from 20 to 300 acres. Slope ranges from 15 to 30 percent.

The typical sequence, depth, and composition of the layers of the Charlton soils are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this unit in mapping are small areas of Paxton, Chatfield, Hollis, and Watchaug soils. The Paxton soils are throughout the unit and have a dense substratum. The Chatfield and Hollis soils are commonly on shoulder slopes and ridgetops and near rock outcrops. The Watchaug soils are along drainageways and in depressional areas. They are moderately well drained. The areas of included soils are as much as 5 acres each.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland in public parks.

Dwellings, septic tanks, roads and streets, and recreation.—Slope and the areas of exposed bedrock are the main limitations. Land shaping and grading will help overcome the slope. Maintaining a plant cover during construction and quickly establishing a plant cover after construction will help control erosion at building sites.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The Charlton soils have few or no limitations for woodland management.

Capability classification: VIIs.

CmB—Charlton-Urban land complex, 2 to 8 percent slopes. This unit is on uplands. It consists of very deep, well drained, gently sloping Charlton soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 45 percent Charlton soils, 30 percent urban land, and 25 percent other soils. The Charlton soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 40 to 350 acres.

The typical sequence, depth, and composition of the layers of the Charlton soils are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this unit in mapping are small areas of Udorthents, Paxton, Cheshire, Wallington, and Alden soils. The Udorthents are in areas that have been graded or filled during construction, and some of those areas have a wet substratum. The Paxton and Cheshire soils are throughout the unit and have a dense substratum. The Wallington soils are in shallow depressions, and the Alden soils are in drainageways and depressions. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are in urban developments.

Dwellings, septic tanks, and roads and streets.—The Charlton soils are generally suitable for these uses.

Recreation.—Slope and small stones in and on the soil are the main limitations, mainly for playgrounds. Land shaping will help overcome the slope.

Capability classification: none.

CmD—Charlton-Urban land complex, 15 to 25 percent slopes. This unit is on uplands. It consists of very deep, well drained, moderately steep Charlton soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 60 percent Charlton soils, 20 percent urban land, and 20 percent other soils. The Charlton soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 20 to 300 acres. Slope ranges from 15 to 30 percent.

The typical sequence, depth, and composition of the layers of the Charlton soils are as follows—

Surface layer:
0 to 5 inches, dark brown fine sandy loam

Subsoil:
5 to 25 inches, brown gravelly loam
25 to 38 inches, yellowish brown gravelly loam

Substratum:
38 to 60 inches, dark yellowish brown very gravelly sandy loam

Included with this unit in mapping are small areas of Udorthents, Paxton, Cheshire, Wallington, and Alden soils. The Udorthents are in areas that have been graded or filled during construction, and some of those areas have a wet substratum. The Paxton and Cheshire soils are throughout the unit and have a dense substratum. The Wallington soils are in shallow depressions, and the Alden soils are in drainageways and depressions. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in urban developments.

Dwellings, septic tanks, roads and streets, and recreation.—Slope is the main limitation for these uses. Land shaping and special design of buildings and roads will help overcome the slope. The erosion hazard is severe during construction. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help to control erosion at building sites.

Capability classification: none.

CoC—Chatfield-Rock outcrop complex, rolling. This unit is on bedrock-controlled uplands. It consists of moderately deep, well drained Chatfield soils and areas of rock outcrop that commonly appear as ledges. The unit consists of about 60 percent Chatfield soils, 15 percent rock outcrop, and 25 percent other soils. The Chatfield soils and areas of rock outcrop are so intermingled that it was not practical to map them separately. Slope ranges from 5 to 15 percent.

The typical sequence, depth, and composition of the layers of the Chatfield soils are as follows—

Surface layer:
Surface to 9 inches, very dark grayish brown gravelly sandy loam

Subsoil:
9 to 25 inches, dark yellowish brown loam or gravelly sandy loam

Bedrock:
25 inches, hard granite

Included with this unit in mapping are areas of Hollis, Charlton, and Watchaug soils. The Hollis soils are near the rock outcrop and on ridgetops. Charlton soils are on foot slopes and concave areas of the side slopes. The Watchaug soils are along drainageways. The areas of included soils are up to 5 acres each.

Major properties of the Chatfield soils—

Permeability: moderate to moderately rapid throughout
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are in idle land or forest. Some areas are used for community development.

Dwellings.—The depth to bedrock in the Chatfield soils and the bedrock at the surface are the main limitations. The limitations are more severe for dwellings with basements than for those without basements. Erosion is a hazard during construction. Maintaining the plant cover and quickly establishing a plant cover after construction will reduce erosion.

Local roads and streets.—Slope, the depth to rock, and frost action are the the main limitations. Using special road design will help overcome the slope. Adding coarse-grained subgrade will reduce frost action.

Septic tank absorption fields.—The depth to rock in the Chatfield soils and the bedrock exposures at the surface are the main limitations. Included areas of Charlton soils and nearby areas of Cheshire soils are better suited to septic systems.

Recreation.—Slope, the rock outcrops, and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Woodland.—The potential productivity for sugar maple is moderate on the Chatfield soils, and there are few or no limitations for woodland management.

Capability classification: VIs.

CoD—Chatfield-Rock outcrop complex, hilly. This unit is on bedrock-controlled uplands. It consists of moderately deep, well drained Chatfield soils and areas of rock outcrop that commonly appear as ledges. The unit consists of about 50 percent Chatfield soils, 25 percent rock outcrop, and 25 percent other soils. The Chatfield soils and areas of rock outcrop are so intermingled that it was not practical to map them separately. Slope ranges from 15 to 25 percent.

The typical sequence, depth, and composition of the layers of the Chatfield soils are as follows—

Surface layer:
Surface to 9 inches, very dark grayish brown gravelly sandy loam

Subsoil:
9 to 25 inches, dark yellowish brown loam or gravelly sandy loam

Bedrock:
25 inches, hard granite

Included with this unit in mapping are areas of Hollis, Charlton, and Watchaug soils. The Hollis soils are near the rock outcrop and on ridgetops. Charlton soils are on foot slopes and concave areas of the side slopes. The Watchaug soils are along drainageways. The areas of included soils are up to 5 acres each.

Major properties of the Chatfield soils—

Permeability: moderate to moderately rapid throughout
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are in idle land or forest.

Dwellings.—Slope, the depth to bedrock in the Chatfield soils, and the bedrock at the surface are the main limitations. The bedrock limitation is more severe for dwellings with basements than for those without basements. Special design will help overcome the slope. Erosion is a hazard during construction. Maintaining the plant cover and quickly establishing a plant cover after construction will reduce erosion at building sites.

Local roads and streets.—Slope, the depth to rock, and frost action are the main limitations. Using special road design will help overcome the slope. Adding coarse-grained subgrade will reduce frost action.

Septic tank absorption fields.—Slope, the depth to rock in the Chatfield soils, and the bedrock exposures at the surface are the main limitations. Included areas of Charlton soils and nearby areas of Cheshire soils are better suited to septic systems.

Recreation.—Slope, the rock outcrops, and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Woodland.—The potential productivity for sugar maple is moderate on the Chatfield soils. Slope limits the use of equipment for woodland management.

Capability classification: VIs.

CrB—Cheshire gravelly fine sandy loam, 2 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is on ridgetops on uplands. The areas range from 5 to 500 acres and commonly are oblong. Slopes are convex and range in length from 100 to 300 feet.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 10 inches, very dark grayish brown gravelly fine sandy loam

Subsoil:

10 to 22 inches, reddish brown gravelly fine sandy loam

Substratum:

22 to 60 inches, dark reddish brown gravelly sandy loam

Included with this soil in mapping are small areas of Wethersfield, Yalesville, and Watchaug soils. The Wethersfield and Yalesville soils are throughout the unit. The Watchaug soils are in depressional areas. Also included are small wooded areas of Cheshire soils that have stones on the surface. Included areas are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland and grassland. Some areas are used for community development, and some are farmland. This soil is classified as prime farmland.

Dwellings, roads and streets, and septic tanks.—This soil has few or no limitations for these uses.

Recreation.—Small stones in and on the soil are the main limitations. A sandy fill material will cover the stones.

Woodland.—The potential productivity of this soil for red oak is moderate. The soil has few or no limitations for woodland management.

Capability classification: IIe.

CrC—Cheshire gravelly fine sandy loam, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and well drained. It is on ridgetops and side slopes on uplands. The areas range from 5 to 200 acres and commonly are oblong. Slopes are smooth and convex.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 10 inches, very dark grayish brown gravelly fine sandy loam

Subsoil:

10 to 22 inches, reddish brown gravelly fine sandy loam

Substratum:

22 to 60 inches, dark reddish brown gravelly sandy loam

Included with this soil in mapping are small areas of Wethersfield, Yalesville, and Watchaug soils. The Wethersfield and Yalesville soils are throughout the unit. The Watchaug soils are in depressional areas. Also included are small wooded areas of Cheshire soils that have stones on the surface. Included areas are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland and grassland. Some areas are used for community development, and some are farmland.

Dwellings, roads and streets, and septic tanks.—Slope is the main limitation for these uses. Special design of roads and buildings will help overcome the slope. Distribution lines on the contour and drop boxes or other structures that ensure even distribution of effluent will help overcome the limitation for septic tanks.

Recreation.—Slope and small stones in and on the soil are the main limitations. A sandy fill material will cover the stones.

Woodland.—The potential productivity of this soil for red oak is moderate. The soil has few or no limitations for woodland management.

Capability classification: IIIe.

CuB—Cheshire-Urban land complex, 2 to 8 percent slopes. This unit is on ridges on uplands. It consists of very deep, well drained, gently sloping Cheshire soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 45 percent Cheshire soils, 30 percent urban land, and 25 percent other soils. The Cheshire soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 20 to 200 acres. Slope ranges from 15 to 30 percent.

The typical sequence, depth, and composition of the layers of the Cheshire soils are as follows—

Surface layer:

0 to 10 inches, very dark grayish brown gravelly fine sandy loam

Subsoil:

10 to 22 inches, reddish brown gravelly fine sandy loam

Substratum:

22 to 60 inches, dark reddish brown gravelly sandy loam

Included with this soil in mapping are small areas of Wethersfield, Yalesville, and Watchaug soils. The Wethersfield and Yalesville soils are throughout the unit. The Watchaug soils are in depressional areas. Also included are small wooded areas of Cheshire soils that have stones on the surface and areas of Udorthents. Included areas are up to 5 acres each.

Major properties of the Cheshire soils—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are in urban developments.

Dwellings, septic tanks, and roads and streets.—The Cheshire soils are generally suitable for these uses.

Recreation.—Small stones in and on the soil are the main limitations. A sandy fill material will cover the stones.

Woodland.—The potential productivity for northern red oak on the Cheshire soils is moderate. There are few or no limitations for woodland management.

Capability classification: none.

CuC—Cheshire-Urban land complex, 8 to 15 percent slopes. This unit is on ridges and side slopes on uplands. It consists of very deep, well drained, strongly sloping Cheshire soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 60 percent Cheshire soils, 20 percent urban land, and 20 percent other soils. The Cheshire soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 20 to 200 acres. Slope ranges from 15 to 30 percent.

The typical sequence, depth, and composition of the layers of the Cheshire soils are as follows—

Surface layer:

0 to 10 inches, very dark grayish brown gravelly fine sandy loam

Subsoil:

10 to 22 inches, reddish brown gravelly fine sandy loam

Substratum:

22 to 60 inches, dark reddish brown gravelly sandy loam

Included with this soil in mapping are small areas of Wethersfield, Yalesville, and Watchaug soils. The Wethersfield and Yalesville soils are throughout the unit. The Watchaug soils are in depressional areas. Also included are small wooded areas of Cheshire soils that have stones on the surface and areas of Udorthents. Included areas are up to 5 acres each.

Major properties of the Cheshire soils—

Permeability: moderate to moderately rapid throughout
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas are in urban developments.

Dwellings, septic tanks, and roads and streets.—Slope is the main limitation for these uses. Special design of roads and buildings will help overcome the slope. Distribution lines on the contour and drop boxes or other structures that ensure even distribution of effluent will help overcome the limitation for septic tanks.

Recreation.—Slope and small stones in and on the soil are the main limitations. A sandy fill material will cover the stones.

Woodland.—The potential productivity for northern red oak on the Cheshire soils is moderate. There are few or no limitations for woodland management.

Capability classification: none.

Fh—Fluvaquents and Medisaprists, ponded. This unit consists of very deep, very poorly drained soils on flood plains and in basin-like depressions on till plains. Slopes range from 0 to 2 percent. These soils receive and store surface runoff from the surrounding areas. The Fluvaquents are mainly on flood plains adjacent to stream channels. The Medisaprists are in depressions on till plains and in marshes on flood plains. The areas of the unit are long and narrow or oval and range from 5 to 150 acres. Some areas of the unit consist entirely of Fluvaquents, some entirely of Medisaprists, and some of both. The total acreage of this unit is about 40 percent Fluvaquents, 35 percent Medisaprists, and 25 percent other soils.

The sequence, depth, and composition of the layers of Fluvaquents are variable, but the range is as follows—

Surface layer:
Surface to 7 inches, very dark gray to brown, sandy loam to silty clay loam

Substratum:
7 to 60 inches, stratified very dark gray to light brownish gray fine sandy loam to silty clay loam

The sequence, depth, and composition of the layers of Medisaprists are variable, but the range is as follows—

Surface layer:
Surface to 16 inches, very dark brown to black mucky silt loam to muck

Substratum:
16 to 60 inches, gray mucky silt loam to fine sand

Included with this unit in mapping are areas of Riverhead, Fredon, Alden, Sloan, and Carlisle soils. The Carlisle soils are intermingled with Medisaprists in bogs and depressions. The Alden soils are near the edges of bogs and depressions. The Riverhead and Fredon soils are on ridges and knolls above Fluvaquents and Medisaprists. The Sloan soils are on flood plains near Fluvaquents. The areas of included soils are up to 5 acres each.

Major properties of the Fluvaquents—

Depth to the water table: 1 foot above the surface to 1 foot below (fall to spring)
Flooding: frequent (fall to spring)
Surface runoff: ponded
Available water capacity: very high

Major properties of the Medisaprists—

Depth to the water table: 1 foot above the surface to 1 foot below for most of the year
Flooding: frequent (fall to spring)
Surface runoff: ponded
Available water capacity: very high

Use.—Most areas of this unit are forests or marshes.

Dwellings, local roads and streets, and septic tank absorption fields.—Flooding and seasonal wetness make this unit generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields. Onsite evaluations are needed to determine the potential of the unit for these uses.

Woodland.—The potential productivity of this unit for wood production is low. Brush and low-grade hardwoods such as cottonwood, red maple, and poplar will grow in many places and make suitable wildlife habitat.

Hay and pasture.—This unit can be used for pasture, but suitability is poor and some areas are inaccessible. Weed and brush control, rotation grazing, proper stocking rates, and fertilizing will help improve forage yields.

Capability classification: Vw.

Fr—Fredon loam. This soil is on terraces. It is very deep and somewhat poorly drained and poorly drained. The areas are commonly oval and range from 5 to 20 acres. Slopes range from 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
Surface to 10 inches, light brownish gray loam

Subsoil:
10 to 15 inches, light brownish gray fine sandy loam
15 to 25 inches, brown gravelly fine sandy loam and many yellowish brown mottles

Substratum:
25 to 60 inches, brown very gravelly loamy sand

Included with this soil in mapping are areas of Carlisle, Adrian, and Alden soils. These soils are throughout the unit. Also included are small areas of Fluvaquents and Medisaprists along streams and drainageways. The included areas are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer, moderately slow and moderate in the subsoil, and rapid in the substratum
Available water capacity: high
Soil reaction: moderately acid to neutral in the surface layer and subsoil and moderately acid to moderately alkaline in the substratum
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: surface to 1.5 feet below the surface (October to June)
Depth to bedrock: more than 60 inches
Flooding hazard: occasional, brief (January to April)

Use.—Most areas of this unit are in forests. Some areas are in grasses and shrubs. Where drained, this soil is classified as prime farmland.

Dwellings.—Flooding is the major limitation. Some nearby areas of Riverhead and Haven soils are better suited.

Local roads and streets.—Seasonal wetness, flooding, and frost action are the main limitations. Constructing roads on raised fill and a coarse-grained subgrade will reduce these limitations.

Septic tank absorption fields.—Flooding, poor filtering, and seasonal wetness are the main limitations. Ground-water contamination is a hazard in areas of this soil used as sites for septic systems. The common included and adjacent soils have limitations that are as severe as those in this Fredon soil.

Recreation.—Seasonal wetness and flooding are the main limitations. The adjacent, higher areas of Riverhead and Haven soils are better drained and have fewer limitations as sites for recreation.

Woodland.—The potential productivity for northern red oak on this soil is moderate. Seasonal wetness limits rooting, causing a severe hazard of windthrow. Seasonal wetness and flooding cause high seedling mortality and limit the use of equipment, especially heavy equipment when the soil is soft and wet.

Capability classification: IIIw.

HaA—Haven loam, 0 to 3 percent slopes. This soil is very deep, nearly level, and well drained. It is on stream terraces. The areas range from 5 to 200 acres and are oblong.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown loam

Subsoil:
5 to 14 inches, yellowish brown loam
14 to 28 inches, dark brown to brown loam

Substratum:
28 to 60 inches, dark brown to brown very gravelly sand

Included with this soil in mapping are small areas of Hinckley, Fredon, Wethersfield, and Riverhead soils. The Hinckley soils are on the higher parts of the unit. The Riverhead soils are throughout the unit. The Fredon soils are in lower areas adjacent to streams. The Wethersfield soils are on till plains. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil and very rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: slight
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses. Some areas are used for community development. This soil is classified as prime farmland.

Dwellings.—This soil has few or no limitations as a site for this use.

Local roads and streets.—Frost action is the main limitation. A coarse-grained subgrade will help prevent frost action.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water pollution.

Recreation.—Small stones in and on the soil are the main limitation. A sandy fill material will cover the stones.

Hay and pasture.—This soil is well suited to hay and pasture. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for eastern white pine is very high. The soil has few or no limitations for woodland management.

Capability classification: I.

HaB—Haven loam, 3 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is on ridges and side slopes on stream terraces. The areas range from 5 to 150 acres and are oblong or irregular in shape.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown loam

Subsoil:
5 to 14 inches, yellowish brown loam
14 to 28 inches, dark brown to brown loam

Substratum:
28 to 60 inches, dark brown to brown very gravelly sand

Included with this soil in mapping are small areas of Hinckley, Fredon, Wethersfield, and Riverhead soils. The Hinckley soils are on the higher parts of the unit. The Riverhead soils are throughout the unit. The Fredon soils are in lower areas adjacent to streams. The Wethersfield soils are on till plains. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil and very rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses. Some areas are used for community development. This soil is classified as prime farmland.

Dwellings.—This soil has few or no limitations as a site for this use.

Local roads and streets.—Frost action is the main limitation. A coarse-grained subgrade will help prevent frost action.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water pollution.

Recreation.—Slope and small stones in and on the soil are the main limitations. A sandy fill material will cover the stones.

Hay and pasture.—This soil is well suited to hay and pasture. Proper stocking rates, deferred grazing, fertilizer, and weed control will increase forage yields.

Woodland.—The potential productivity of this soil for eastern white pine is very high. The soil has few or no limitations for woodland management.

Capability classification: IIe.

HbB—Haven-Urban land complex, 0 to 8 percent slopes. This unit is commonly on terraces along major streams. It consists of very deep, well drained, nearly level to gently sloping Haven soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 55 percent Haven soils, 25 percent urban land, and 20 percent other soils. The Haven soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 5 to 200 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches, dark brown loam

Subsoil:
5 to 14 inches, yellowish brown loam
14 to 28 inches, dark brown to brown loam

Substratum:
28 to 60 inches, dark brown to brown very gravelly sand

Included with this unit in mapping are small areas of Udorthents, some of which have a wet substratum. Also included are Hinckley, Fredon, Wethersfield, and Riverhead soils. The Hinckley soils are on the higher parts of the unit. The Riverhead soils are throughout the unit. The Fredon soils are in lower areas adjacent to streams. The Wethersfield soils are on till plains. Included areas are up to 5 acres each.

Major properties of the Haven soils—

Permeability: moderate in the surface layer and subsoil and very rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet

Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in urban developments.

Dwellings.—The Haven soils are generally suitable as a site for this use.

Local roads and streets.—Frost action is the main limitation. A coarse-grained subgrade will help prevent frost action.

Septic tank absorption fields.—Poor filtering causes a hazard of ground-water pollution in areas of this unit used as sites for septic systems.

Recreation.—Slope and small stones in and on the soil are the main limitations, mainly for playgrounds. A sandy fill will cover the stones.

Woodland.—The potential productivity of the Haven soils is very high for eastern white pine.

Hay and pasture.—The Haven soils are well suited to hay and pasture. Rotation grazing, weed control, proper stocking rates, and fertilizer will increase forage yields.

Capability classification: none.

HcA—Hinckley gravelly loamy sand, 0 to 3 percent slopes. This soil is very deep, nearly level, and excessively drained. It is on stream terraces and terraced hillsides. The areas range from 5 to 50 acres and are oblong.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark gray gravelly loamy sand

Subsoil:
4 to 10 inches, strong brown gravelly loamy sand
10 to 17 inches, dark yellowish brown gravelly loamy sand

Substratum:
17 to 60 inches, brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Fredon, Sloan, and Riverhead soils. The Riverhead and Haven soils are on slightly lower parts of the terrace. The Riverhead soils are throughout the unit. The Fredon soils are in depressional areas. The Sloan soils are on flood plains at a lower elevation than the Hinckley soil. Included areas are up to 5 acres each and make up about 10 to 15 percent of the unit.

Major soil properties—

Permeability: rapid in the surface layer and subsoil and very rapid in the substratum
Available water capacity: low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses or are used for community development.

Dwellings and local roads and streets.—This soil has few or no limitations as a site for these uses.

Septic tank absorption fields.—Poor filtering causes a hazard of ground-water pollution in areas of this soil used as a site for septic systems.

Recreation.—Small stones in and on the soil are the main limitation. A sandy fill will cover the stones.

Woodland.—The potential productivity of this soil for eastern white pine is high. Droughtiness causes high seedling mortality.

Capability classification: IIIs.

HcB—Hinckley gravelly loamy sand, 3 to 8 percent slopes. This soil is very deep, gently sloping, and excessively drained. It is on stream terraces and terraced hillsides. The areas range from 5 to 30 acres and are oblong or long and narrow.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark gray gravelly loamy sand

Subsoil:
4 to 10 inches, strong brown gravelly loamy sand
10 to 17 inches, dark yellowish brown gravelly loamy sand

Substratum:
17 to 60 inches, brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Fredon, Sloan, and Riverhead soils. The Riverhead and Haven soils are on slightly lower parts of the terraces. The Riverhead soils are throughout the unit. The Fredon soils are in depressional areas. The Sloan soils are on flood plains at a lower elevation than the Hinckley soil. Included areas are up to 5 acres each and make up about 10 to 15 percent of the unit.

Major soil properties—

Permeability: rapid in the surface layer and subsoil and very rapid in the substratum
Available water capacity: low

Soil reaction: extremely acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses or are used for community development.

Dwellings and local roads and streets.—This soil has few or no limitations as a site for these uses.

Septic tank absorption fields.—Poor filtering causes a hazard of ground-water pollution in areas of this soil used as sites for septic systems.

Recreation.—Small stones in and on the soil are the main limitation. A sandy fill will cover the stones.

Woodland.—The potential productivity of this soil for eastern white pine is high. Droughtiness causes high seedling mortality.

Capability classification: IIIs.

HcC—Hinckley gravelly loamy sand, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and excessively drained. It is on the sides of stream terraces and on terraced hillsides. The areas range from 5 to 40 acres and are oblong or long and narrow.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark gray gravelly loamy sand

Subsoil:
4 to 10 inches, strong brown gravelly loamy sand
10 to 17 inches, dark yellowish brown gravelly loamy sand

Substratum:
17 to 60 inches, brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Fredon, Sloan, and Riverhead soils. The Riverhead and Haven soils are on slightly lower parts of the terrace. The Riverhead soils are throughout the unit. The Fredon soils are in depressional areas. The Sloan soils are on flood plains at a lower elevation than the Hinckley soil. Included areas are up to 5 acres each and make up about 10 to 15 percent of the unit.

Major soil properties—

Permeability: rapid in the surface layer and subsoil and very rapid in the substratum
Available water capacity: low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: medium to rapid
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses or by trees.

Dwellings and local roads and streets.—Slope is the main limitation of the soil as a site for these uses. Maintaining the plant cover and quickly establishing the plant cover after construction will help control erosion at building sites. Special design of roads and buildings will help overcome the slope.

Septic tank absorption fields.—Poor filtering causes a hazard of ground-water pollution in areas of this soil used as sites for septic systems.

Recreation.—Slope and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Woodland.—The potential productivity of this soil for eastern white pine is high. Droughtiness causes high seedling mortality.

Capability classification: IVs.

HcD—Hinckley gravelly loamy sand, 15 to 25 percent slopes. This soil is very deep, moderately steep, and excessively drained. It is on the sides of stream terraces and on terraced hillsides. The areas range from 5 to 50 acres and are irregular in shape or long and narrow.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark gray gravelly loamy sand

Subsoil:
4 to 10 inches, strong brown gravelly loamy sand
10 to 17 inches, dark yellowish brown gravelly loamy sand

Substratum:
17 to 60 inches, brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Fredon, Sloan, and Riverhead soils. The Riverhead and Haven soils are on slightly lower parts of the terrace. The Riverhead soils are throughout the unit. The Fredon soils are in depressional areas. The Sloan soils are on flood plains at a lower elevation than the Hinckley soil. Included areas are up to 5 acres each and make up about 10 to 15 percent of the unit.

Major soil properties—

Permeability: rapid in the surface layer and subsoil and very rapid in the substratum
Available water capacity: low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered by shrubs and grasses or by trees.

Dwellings, local roads and streets, and recreation.—Slope is the main limitation of the soil as a site for these uses. Maintaining the plant cover and quickly establishing the plant cover after construction will help control erosion at building sites. Special design of roads and buildings will help overcome the slope.

Septic tank absorption fields.—Slope is a major limitation, and poor filtering causes a hazard of ground-water pollution in areas of this soil used as a sites for septic systems.

Woodland.—The potential productivity of this soil for eastern white pine is high. Droughtiness causes high seedling mortality. Slope limits the use of equipment.

Capability classification: VIs

HdB—Hinckley-Urban land complex, 0 to 8 percent slopes. This unit is commonly along river valleys. It consists of very deep, excessively drained, nearly level to gently sloping Hinckley soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 45 percent Hinckley soils, 30 percent urban land, and 25 percent other soils. The Hinckley soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 10 to 300 acres.

The typical sequence, depth, and composition of the layers of the Hinckley soils are as follows—

Surface layer:
0 to 4 inches, very dark gray gravelly loamy sand

Subsoil:
4 to 10 inches, strong brown gravelly loamy sand
10 to 17 inches, dark yellowish brown gravelly loamy sand

Substratum:
17 to 60 inches, brown very gravelly sand

Included with this soil in mapping are small areas of Udorthents, some of which have a wet substratum. Also included are Haven, Fredon, Sloan, and Riverhead soils. The Riverhead and Haven soils are on slightly lower parts of the terrace. The Riverhead soils are throughout the unit. The Fredon soils are in depressional areas. The Sloan soils are on flood plains at a lower elevation than the Hinckley soils. Included areas are up to 5 acres each.

Major properties of the Hinckley soils—

Permeability: rapid in the surface layer and subsoil and very rapid in the substratum
Available water capacity: low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in urban developments.

Dwellings and local roads and streets.—The Hinckley soils are generally suitable as a site for these uses.

Septic tank absorption fields.—Poor filtering causes a hazard of ground-water pollution in areas of this unit used as sites for septic systems.

Recreation.—Small stones in and on the soil are the main limitation, mainly for playgrounds. A sandy fill will cover the stones.

Capability classification: none.

HIF—Hollis-Rock outcrop complex, very steep. This unit is on hillsides on bedrock-controlled uplands. It consists of shallow, well drained and somewhat excessively drained Hollis soils and areas of rock outcrop that commonly appear as ledges. The unit consists of about 50 percent Chatfield soils, 30 percent rock outcrop, and 20 percent other soils. The Hollis soils and areas of rock outcrop are so intermingled that it was not practical to map them separately. Slope ranges from 35 to 60 percent.

The typical sequence, depth, and composition of the layers of the Hollis soils are as follows—

Surface layer:
Surface to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
9 to 18 inches, yellowish brown fine sandy loam

Bedrock:
18 inches, hard and unweathered

Included with this unit in mapping are small areas of Charlton, Chatfield, and Watchaug soils. The Charlton soils are at the base of very steep slopes. The Chatfield soils are on the upper parts of slopes. The Watchaug soils are along drainageways. The areas of included soils are as much as 5 acres each.

Major properties of the Hollis soils—

Permeability: moderate to moderately rapid throughout
Available water capacity: very low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 10 to 20 inches

Use.—Most areas of this soil are shrubbery and grasses or woodland.

Dwellings, septic tanks, and roads and streets.—Slope and the depth to bedrock in the Hollis soils are the main limitations of this unit as a site for these uses.

Recreation.—The slope, the depth to bedrock, and small stones in and on the soil are the main limitations for this use.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The bedrock restricts rooting, making windthrow a hazard. Slope limits the use of equipment.

Capability classification: VIIs.

HoC—Holyoke-Rock outcrop complex, rolling. This unit is on bedrock-controlled uplands. It consists of shallow, well drained or somewhat excessively drained Holyoke soils and areas of exposed bedrock that commonly appear as ledges. The unit consists of about 60 percent Holyoke soils, 15 percent rock outcrop, and 25 percent other soils. The Holyoke soils and rock outcrop are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 10 to 100 acres. Slope ranges from 3 to 15 percent.

The typical sequence, depth, and composition of the layers of the Holyoke soils are as follows—

Surface layer:
0 to 4 inches, dark brown silt loam

Subsoil:
4 to 10 inches, strong brown silt loam
10 to 16 inches, reddish brown silt loam

Bedrock:
16 inches, strongly jointed diabase

Included with this unit in mapping are small areas of Charlton, Chatfield, and Watchaug soils. The Charlton soils are at the base of very steep slopes. The Chatfield soils are on the upper parts of slopes. The Watchaug soils are along drainageways. The areas of included soils are as much as 5 acres each.

Major soil properties—

Permeability: moderate throughout
Available water capacity: very low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: 10 to 20 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Dwellings, septic tanks, roads and streets, and recreation.—The depth to bedrock in the Holyoke soils and the areas of exposed bedrock are the main limitations. Small stones in and on the soil are an additional limitation for recreation. Extensive alterations and fill are needed to overcome the limitations.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The bedrock limits rooting, causing a hazard of windthrow, and droughtiness causes high seedling mortality.

Capability classification: VIs.

HoD—Holyoke-Rock outcrop complex, hilly. This unit is on ridges and side slopes on bedrock-controlled uplands. It consists of shallow, well drained or somewhat excessively drained Holyoke soils and areas of exposed bedrock that commonly appear as ledges. The unit consists of about 55 percent Holyoke soils, 20 percent rock outcrop, and 25 percent other soils. The Holyoke soils and rock outcrop are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 10 to 150 acres. Slope ranges from 15 to 25 percent.

The typical sequence, depth, and composition of the layers of the Holyoke soils are as follows—

Surface layer:
0 to 4 inches, dark brown silt loam

Subsoil:
4 to 10 inches, strong brown silt loam
10 to 16 inches, reddish brown silt loam

Bedrock:
16 inches, strongly jointed diabase

Included with this unit in mapping are small areas of Charlton, Chatfield, and Watchaug soils. The Charlton soils are at the base of very steep slopes. The Chatfield soils are on the upper parts of slopes. The Watchaug soils are along drainageways. The areas of included soils are as much as 5 acres each.

Major soil properties—

Permeability: moderate throughout
Available water capacity: very low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 10 to 20 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Dwellings, septic tanks, roads and streets, and recreation.—Slope, the depth to bedrock in the Holyoke soils, and the areas of exposed bedrock are the main limitations. Small stones in and on the soil are an additional limitation for recreation. Extensive alterations and fill are needed to overcome the limitations.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The bedrock limits rooting, causing a hazard of windthrow, and droughtiness causes high seedling mortality. Slope limits the use of equipment.

Capability classification: VIs.

HoF—Holyoke-Rock outcrop complex, very steep. This unit is on valley sides on bedrock-controlled uplands. It consists of shallow, well drained or somewhat excessively drained Holyoke soils and areas of exposed bedrock that appear as ledges. The unit consists of about 45 percent Holyoke soils, 30 percent rock outcrop, and 25 percent other soils. The Holyoke soils and rock outcrop are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 10 to 100 acres. Slope ranges from 25 to 50 percent.

The typical sequence, depth, and composition of the layers of the Holyoke soils are as follows—

Surface layer:
0 to 4 inches, dark brown silt loam

Subsoil:
4 to 10 inches, strong brown silt loam
10 to 16 inches, reddish brown silt loam

Bedrock:
16 inches, strongly jointed diabase

Included with this unit in mapping are small areas of Charlton, Chatfield, and Watchaug soils. The Charlton soils are at the base of very steep slopes. The Chatfield soils are on the upper parts of slopes. The Watchaug soils are along drainageways. The areas of included soils are as much as 5 acres each.

Major soil properties—

Permeability: moderate throughout
Available water capacity: very low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: more than 6 feet
Depth to bedrock: 10 to 20 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Dwellings, septic tanks, roads and streets, and recreation.—Slope, the depth to bedrock in the Holyoke soils, and the areas of exposed bedrock are the main limitations. Small stones in and on the soil are an additional limitation for recreation. Extensive alterations and fill are needed to overcome the limitations.

Woodland.—The potential productivity for northern red oak on this unit is moderate. The bedrock limits rooting, causing a hazard of windthrow, and droughtiness causes high seedling mortality. Slope limits the use of equipment.

Capability classification: VIIs.

HuC—Holyoke-Urban land-Rock outcrop complex, rolling. This unit is on valley sides on bedrock-controlled uplands. It consists of shallow, well drained or somewhat excessively drained Holyoke soils, areas covered by buildings and other structures, and areas of exposed bedrock that appear as ledges. The unit consists of about 40 percent Holyoke soils, 25 percent urban land, 15 percent rock outcrop, and 20 percent other soils. The Holyoke soils and rock outcrop and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 10 to 100 acres. Slope ranges from 3 to 15 percent.

The typical sequence, depth, and composition of the layers of the Holyoke soils are as follows—

Surface layer:
0 to 4 inches, dark brown silt loam

Subsoil:
4 to 10 inches, strong brown silt loam
10 to 16 inches, reddish brown silt loam

Bedrock:
16 inches, strongly jointed diabase

Included with this unit in mapping are small areas of Udorthents, some of which have a wet substratum. Also included are Charlton, Chatfield, and Watchaug soils. The Charlton soils are at the base of very steep slopes. The Chatfield soils are on the upper parts of slopes. The Watchaug soils are along drainageways. The areas of included soils are as much as 5 acres each.

Major properties of the Holyoke soils—

Permeability: moderate throughout
Available water capacity: very low
Soil reaction: extremely acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 10 to 20 inches

Use.—Most areas of this soil are used for community development.

Dwellings, septic tanks, roads and streets, and recreation.—The depth to bedrock in the Holyoke soils is the main limitation. Small stones in and on the soil are an additional limitation for recreation. Extensive alterations and fill are needed to overcome the limitation.

Capability classification: none.

Ip—Ipswich mucky peat. This soil is nearly level, very deep, and very poorly drained. It is along the Hudson River near Iona Island and Haverstraw and at Piermont. It is subject to daily tidal inundation. The areas of the unit are long and narrow and range from 5 to 50 acres. Slope is 0 to 1 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 12 inches, dark olive gray mucky peat

Subsurface layer:
12 to 40 inches, dark olive muck

Bottom layer:
40 to 60 inches, black muck

Included with this soil in mapping are areas of Fluvaquents and Udifluvents and small areas of Udorthents that have a wet substratum. Fluvaquents and Udifluvents are near the Hudson River. Udorthents are in areas along the shoreline that have been filled or cut. Included areas range from 2 to 5 acres and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate to rapid throughout
Available water capacity: very high
Soil reaction: strongly acid to mildly alkaline throughout
Surface runoff: very slow or ponded
Erosion hazard: susceptible to wind erosion
Depth to the water table: 1 foot above to surface (year-round)
Depth to bedrock: more than 60 inches
Flooding hazard: frequent, very brief (year-round)

Use.—Most areas of this soil are covered by herbaceous water-tolerant plants.

Dwellings, local roads and streets, septic tank absorption fields, and recreation.—Frequent flooding, ponding, and low strength are the main limitations. The included soils also have limitations for dwellings. Nearby soils that are higher on the landscape and better drained, such as Riverhead and Charlton soils, are better suited for buildings and septic tanks. Poor filtering causes contamination of the ground water in areas of the soil used as sites for septic systems. Many areas are inaccessible for recreation or do not support traffic.

Woodland.—The potential productivity of this soil for silver maple is moderate. Seasonal wetness causes high seedling mortality. It also restricts rooting, causing a windthrow hazard. The soil is soft when wet and is unable to support heavy equipment.

Capability classification: VIIIw.

Pa—Palms muck. This soil is very deep, nearly level, and very poorly drained. It is in depressional areas of outwash plains. The areas are commonly oval or irregular in shape and range mainly from 5 to 50 acres. Slopes range from 0 to 2 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 32 inches, black muck

Substratum:
32 to 36 inches, dark grayish brown very fine sandy loam
36 to 55 inches, yellowish red silt loam
55 to 62 inches, reddish brown silty clay loam

Included with this soil in mapping are small areas of Carlisle and Adrian soils mixed together throughout the unit. Also included are small areas of Alden soils at the edge of the unit and Fredon soils on knolls. Included areas are up to 5 acres each and make up about 20 to 25 percent of the unit.

Major soil properties—

Permeability: moderately slow to moderately rapid in the surface layer and moderately slow or slow in the substratum
Available water capacity: high
Soil reaction: strongly acid to mildly alkaline in the surface layer and slightly acid to moderately alkaline in the substratum
Surface runoff: very slow or ponded
Erosion hazard: severe by wind
Depth to the water table: 1 foot above the surface to 1 foot below the surface (November to May)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are covered with water-tolerant grasses and shrubs.

Dwellings.—Subsidence, ponding, and low strength are the main limitations of the soil as a site for dwellings. The included soils also have limitations for dwellings. Some nearby mineral soils that are higher on the landscape and better drained, such as Riverhead and Charlton soils, are more suitable for dwellings.

Local roads and streets.—Subsidence, ponding, and frost action are the main limitations of the soil as a site for local roads and streets. Some nearby soils, such as Riverhead soils, also are limited by frost action but are more suitable than this Adrian soil.

Septic tank absorption fields.—Prolonged periods of wetness, water on the surface, and subsidence are the main limitations of the soil as a site for most types of septic tank absorption fields. Poor filtering is common, and contamination of the ground water is a hazard. Most of the included soils have similiar limitations, but some of the Charlton soils on adjacent uplands are generally suitable as sites for septic tank absorption fields.

Recreation.—Ponding for prolonged periods and the organic material in the upper part of the soil are the main limitations for recreation development. The ponding makes many areas inaccessible for much of the year. The organic material does not support heavy traffic.

Woodland.—The potential productivity of this soil for red maple is moderate. The water table causes severe seedling mortality and restricts rooting, making windthrow a hazard. The surface layer is soft when wet and generally does not support heavy equipment.

Capability classification: Vw.

PnB—Paxton gravelly fine sandy loam, 2 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is on hilltops and hillsides on uplands. The areas range from 10 to 100 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Subsoil:
3 to 25 inches, yellowish brown gravelly loam and 20 percent rock fragments
25 to 29 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Substratum:
29 to 60 inches, very firm and dense, grayish brown gravelly fine sandy loam and 30 percent rock fragments

Included with this soil in mapping are small areas of Wethersfield, Yalesville, Chatfield, and Charlton soils on hilltops and hillsides. Included areas are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: 1.5 to 2.0 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development. This soil is classified as prime farmland.

Woodland.—The potential productivity of this soil for red oak is moderate. Seasonal wetness causes moderate seedling mortality. The soil has few or no other limitations for woodland management.

Hay and pasture.—This soil is very well suited to hay and pasture. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Seasonal wetness is the main limitation. Installing a subsurface drainage system and sealing foundations will help overcome the wetness.

Local roads and streets.—Wetness and frost action are the major limitations. Constructing roads on raised, coarse-grained fill will help overcome the limitation.

Septic tank absorption fields.—Slow percolation is the main limitation. Enlarging the absorption field or the trenches below the distribution lines will increase the absorption of effluent.

Recreation.—Slow percolation, slope, and small stones in and on the soil are the main limitations.

Capability classification: IIe.

PnC—Paxton gravelly fine sandy loam, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and well drained. It is on the sides of hills and ridges on uplands. The areas range from 10 to 180 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Subsoil:
3 to 25 inches, yellowish brown gravelly loam and 20 percent rock fragments
25 to 29 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Substratum:
29 to 60 inches, very firm and dense, grayish brown gravelly fine sandy loam and 30 percent rock fragments

Included with this soil in mapping are small areas of Wethersfield, Yalesville, Chatfield, and Charlton soils on the sides of hills and ridges. Also included are areas that have stones on the surface and eroded areas. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: 1.5 to 2.0 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Woodland.—The potential productivity of this soil for red oak is moderate. Seasonal wetness causes moderate seedling mortality. The soil has few or no other limitations for woodland management.

Hay and pasture.—This soil is well suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Seasonal wetness and slope are the main limitations. Installing a subsurface drainage system and sealing foundations will help overcome the wetness. Grading or special design will help overcome the slope. Using temporary erosion-control structures and quickly establishing a plant cover after construction will help control erosion at building sites.

Local roads and streets.—Wetness, slope, and frost action are the major limitations. Constructing roads on raised, coarse-grained fill will help overcome the wetness and frost action. Grading and land shaping will help overcome the slope.

Septic tank absorption fields.—Slow percolation is the main limitation. Enlarging the absorption field or the trenches below the distribution lines will increase the absorption of effluent.

Recreation.—Slow percolation, slope, and small stones in and on the soil are the main limitations. A sandy fill will cover the stones at playgrounds. Land shaping and grading will help overcome the slope.

Capability classification: IIIe.

PsC—Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony. This soil is very deep, gently sloping to strongly sloping, and well drained. It is on the sides of hills and foot slopes on uplands. Stones that are 10 to 24 inches in diameter cover about 3 percent of the surface. The areas range from 10 to 240 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Subsoil:
3 to 25 inches, yellowish brown gravelly loam and 20 percent rock fragments
25 to 29 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Substratum:
29 to 60 inches, very firm and dense, grayish brown gravelly fine sandy loam and 30 percent rock fragments

Included with this soil in mapping are small areas of Wethersfield, Yalesville, Chatfield, and Charlton soils on the sides of hills and ridges. Also included are areas that have more stones or boulders on the surface and eroded areas. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: 1.5 to 2.0 feet (February to May)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Woodland.—The potential productivity of this soil for red oak is moderate. Seasonal wetness causes moderate seedling mortality, and restricted rooting makes windthrow a hazard. The soil has few or no other limitations for woodland management.

Hay and pasture.—This soil is poorly suited to hay and pasture. The stones on the surface are the major limitation. Erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Seasonal wetness and slope are the main limitations. Installing a subsurface drainage system and sealing foundations will help overcome the wetness. Grading or special design will help overcome the slope. Using temporary erosion-control structures and quickly establishing a plant cover after construction will help control erosion at building sites.

Local roads and streets.—Wetness, slope, and frost action are the major limitations. Constructing roads on raised, coarse-grained fill will help overcome the wetness and frost action. Grading and land shaping will help overcome the slope.

Septic tank absorption fields.—Slow percolation is the main limitation. Enlarging the absorption field or the trenches below the distribution lines will increase the absorption of effluent.

Recreation.—Slow percolation, slope, and small stones in and on the soil are the main limitations. A sandy fill will cover the stones at playgrounds. Land shaping and grading will help overcome the slope.

Capability classification: VIs.

PsE—Paxton gravelly fine sandy loam, 15 to 35 percent slopes, very stony. This soil is very deep, moderately steep and steep, and well drained. It is on the sides of hills and ridges on uplands. Stones that are 10 to 24 inches in diameter cover about 3 percent of the surface. The areas range from 10 to 240 acres and are irregularly shaped.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Subsoil:
3 to 25 inches, yellowish brown gravelly loam and 20 percent rock fragments
25 to 29 inches, brown gravelly fine sandy loam and 20 percent rock fragments

Substratum:
29 to 60 inches, very firm and dense, grayish brown gravelly fine sandy loam and 30 percent rock fragments

Included with this soil in mapping are small areas of Wethersfield, Yalesville, Chatfield, and Charlton soils on the sides of hills and ridges. Also included are areas that have more stones or boulders on the surface and eroded areas. Included areas are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: low
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid

Erosion hazard: severe
Depth to the water table: 1.5 to 2.0 feet (February to May)
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are used for community development.

Woodland.—The potential productivity of this soil for red oak is moderate. Slope limits the use of equipment. Seasonal wetness causes moderate seedling mortality, and restricted rooting makes windthrow a hazard.

Hay and pasture.—This soil is generally unsuited to hay and pasture. The stones on the surface and the slope are the major limitations.

Dwellings, local roads and streets, and recreation.—Slope is the main limitation. Special design and grading are needed to overcome the limitation.

Septic tank absorption fields.—Slope and slow percolation are the main limitations.

Capability classification: VIIs.

Pt—Pits, gravel. This unit consists of areas that have been excavated for sand and gravel. The areas are irregular in shape or rectangular and range from 5 to 100 acres. Many of the pits have short steep slopes along the edges.

The rate of permeability in this unit is rapid or very rapid. In some areas the water table is at or near the surface most of the year. A few areas are adjacent to streams and are subject to periodic flooding.

Included with this unit in mapping are small areas of undisturbed soils, mainly excessively drained Hinckley soils and well drained Riverhead soils. Spots of wetter Fredon soils are in some areas. Also included are areas of spoil consisting of sandy or gravelly overburden, areas of exposed bedrock, and a few small ponds.

A few abandoned pits are used for community development. Onsite investigations are needed to determine the suitability of the unit for most uses.

Capability classification: none.

Pv—Pits, quarry. This unit consists of areas that have been excavated for crushed stone. The areas are irregular in shape or rectangular and range from 3 to 40 acres. Many of the pits have short steep slopes along the edges.

Included with this unit in mapping are small areas of undisturbed soils, mainly well drained Chatfield and Charlton soils on narrow ridges and very poorly drained Alden soils in depressional areas. Also included are a few small ponds. The included areas are up to 3 acres each and make up about 15 to 20 percent of the unit.

A few abandoned pits are used for community development. Onsite investigations are needed to determine the suitability of the unit for most uses.

Capability classification: none.

Ra—Rippowam sandy loam. This soil is very deep, nearly level, and poorly drained. It is on flood plains of rivers and streams. The areas are long and narrow and range from 5 to 75 acres. Slope ranges from 0 to 3 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 10 inches, very dark grayish brown sandy loam

Subsoil:
10 to 19 inches, dark grayish brown fine sandy loam and yellowish brown mottles
19 to 28 inches, grayish brown sandy loam and strong brown mottles

Substratum:
28 to 35 inches, grayish brown and very dark gray fine sandy loam and brown mottles
35 to 60 inches, dark brown loamy sand

Included with this soil in mapping are small areas of Haven, Hinckley, Sloan, and Watchaug soils. The Haven and Hinckley soils are on side slopes above the Rippowam soil. The Sloan soils are mainly in depressions slightly below the Rippowam soil. The Watchaug soils are on till plains adjacent to the flood plain. The areas of included soils in the unit are up to 5 acres each and make up 20 to 25 percent of the unit.

Major soil properties—

Permeability: moderate and moderately rapid in the surface layer and subsoil; rapid or very rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to neutral throughout
Surface runoff: slow
Erosion hazard: none
Depth to the water table: surface to 1.5 feet below the surface (September to June)
Depth to bedrock: more than 60 inches
Flooding hazard: frequent, brief (October to May)

Use.—Most areas of this unit are woodland. Some areas are covered by water-tolerant plants.

Woodland.—The potential productivity of this soil for red maple is moderate. The seasonal wetness and flooding limit the use of equipment and cause seedling mortality. They also restrict rooting, causing a windthrow hazard.

Hay and pasture.—This soil is moderately suited to hay and pasture. Seasonal wetness and flooding damage crops, cause plant competition, and reduce the period that is practical for grazing.

Dwellings.—Frequent flooding and prolonged periods of wetness are the main limitations. Extensive alterations are required to overcome the limitations. Inclusions of less sloping Haven and Hinckley soils on adjacent uplands do not have limitations for dwellings.

Septic tank absorption fields.—Frequent flooding, prolonged periods of wetness, and poor filtering are the main limitations. Contamination of the ground water and surface water is a hazard in areas used as sites for septic systems. Extensive alterations are required to overcome these limitations. Inclusions of Watchaug soils on adjacent till plains are seasonally wet but are better suited as sites for septic systems than is this Rippowam soil.

Local roads and streets.—Frequent flooding, prolonged periods of wetness, and frost action are the main limitations. A coarse-grained fill material will help overcome the limitations. Providing an outlet for surface water will also reduce wetness.

Capability classification: IVw.

ReA—Riverhead fine sandy loam, 0 to 3 percent slopes. This soil is very deep, nearly level, and well drained. It is in river valleys and on outwash plains. The areas are irregular in shape or long and narrow and range from 50 to 300 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
- 9 to 16 inches, strong brown fine sandy loam
- 16 to 24 inches, brown to dark brown sandy loam
- 24 to 30 inches, brown loamy fine sand

Substratum:
- 30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. The areas of included soils are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: slow to medium
Erosion hazard: slight
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are in hay and pasture. Some areas are used for urban development. This soil is classified as prime farmland.

Woodland.—The potential productivity of the soil for sugar maple is moderate. The soil has few or no limitations for woodland management.

Hay and pasture.—This soil is very well suited to hay and pasture. Droughtiness is a hazard during late summer. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings and recreation.—This soil is generally suitable as a site for these uses. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Inclusions of Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Frost action is the main limitation. Using a coarse-grained subgrade or base material will reduce frost action.

Capability classification: IIs.

ReB—Riverhead fine sandy loam, 3 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is in river valleys and on outwash plains. The areas are irregular in shape and range from 20 to 125 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
- 9 to 16 inches, strong brown fine sandy loam

16 to 24 inches, brown to dark brown sandy loam
24 to 30 inches, brown loamy fine sand

Substratum:
30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. The areas of included soils are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are in hay and pasture. Some areas are used for urban development. This soil is classified as prime farmland.

Woodland.—The potential productivity of the soil for sugar maple is moderate. The soil has few or no limitations for woodland management.

Hay and pasture.—This soil is very well suited to hay and pasture. Droughtiness is a hazard during late summer. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings and recreation.—This soil is generally suitable as a site for these uses. Maintaining the plant cover and using temporary erosion-control structures will help control erosion at building sites. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Inclusions of Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Frost action is the main limitation. Using a coarse-grained subgrade or base material will reduce frost action.

Capability classification: IIs.

ReC—Riverhead fine sandy loam, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and well drained. It is in river valleys and on ridgetops and outwash plains. The areas are irregular in shape and range from 10 to 100 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
9 to 16 inches, strong brown fine sandy loam
16 to 24 inches, brown to dark brown sandy loam
24 to 30 inches, brown loamy fine sand

Substratum:
30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. Also included on hillsides are small eroded areas and areas that contain a large amount of rock fragments. The areas of included soils are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: rapid
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland. Some areas are hay and pasture.

Woodland.—The potential productivity of the soil for sugar maple is moderate. The soil has few or no limitations for woodland management.

Hay and pasture.—This soil is well suited to hay and pasture. Droughtiness is a hazard during late summer, and erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings and recreation.—Slope is the main limitation of the soil as a site for these uses. Grading or special design is necessary in some areas. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help control erosion at building sites. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Inclusions of Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Frost action and slope are the main limitations. Using a coarse-grained subgrade or base material will reduce frost action. Land shaping or grading will help overcome the slope.

Capability classification: IIIe.

ReD—Riverhead fine sandy loam, 15 to 25 percent slopes. This soil is very deep, moderately steep, and well drained. It is in river valleys and on ridgetops and outwash plains. The areas are irregular in shape and range from 10 to 75 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:

9 to 16 inches, strong brown fine sandy loam
16 to 24 inches, brown to dark brown sandy loam
24 to 30 inches, brown loamy fine sand

Substratum:

30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. Also included on hillsides are small eroded areas and areas that contain a large amount of rock fragments. The areas of included soils are up to 5 acres each and make up about 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this soil are woodland.

Woodland.—The potential productivity of the soil for sugar maple is moderate. Slope limits the use of equipment. The soil has few or no other limitations for woodland management.

Hay and pasture.—This soil is moderately suited to hay and pasture. Slope is a major limitation. Droughtiness is a hazard during late summer, and erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings and recreation.—Slope is the main limitation of the soil as a site for these uses. Grading or special design is necessary in some areas. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help control erosion at building sites. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Slope is the main limitation. Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome the limitations. Inclusions of less sloping Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Frost action and slope are the main limitations. Using a coarse-grained subgrade or base material will reduce frost action. Land shaping or grading will help overcome the slope.

Capability classification: IVe.

RuB—Riverhead-Urban land complex, 0 to 8 percent slopes. This unit is commonly on ridgetops in river valleys and on outwash plains. It consists of very deep, well drained, nearly level to gently sloping Riverhead soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 40 percent Riverhead soils, 35 percent urban land, and 25 percent other soils. The Riverhead soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape or rectangular and range from 75 to 350 acres.

The typical sequence, depth, and composition of the layers of the Riverhead soils are as follows—

Surface layer:
- 0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
- 9 to 16 inches, strong brown fine sandy loam
- 16 to 24 inches, brown to dark brown sandy loam
- 24 to 30 inches, brown loamy fine sand

Substratum:
- 30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Udorthents, some of which have a water table near the surface. Also included are Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. The areas of included soils are up to 5 acres each.

Major properties of the Riverhead soils—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or near urban development.

Dwellings.—This unit is generally suitable as a site for this use. Maintaining the plant cover and using temporary erosion-control structures will help to control erosion at building sites.

Recreation.—Slope is the main limitation of the soil as a site for this use, especially for playgrounds. Grading or special design is necessary in some areas. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Inclusions of Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Frost action is the main limitation. Using a coarse-grained subgrade or base material will reduce frost action.

Capability classification: none.

RuC—Riverhead-Urban land complex, 8 to 15 percent slopes. This unit is commonly on the tops and sides of ridges in river valleys and on outwash plains. It consists of very deep, well drained, strongly sloping Riverhead soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 50 percent Riverhead soils, 25 percent urban land, and 25 percent other soils. The Riverhead soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 100 to 300 acres.

The typical sequence, depth, and composition of the layers of the Riverhead soils are as follows—

Surface layer:
- 0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
- 9 to 16 inches, strong brown fine sandy loam
- 16 to 24 inches, brown to dark brown sandy loam
- 24 to 30 inches, brown loamy fine sand

Substratum:
- 30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Udorthents, some of which have a water table near the surface. Also included are Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. The areas of included soils are up to 5 acres each.

Major properties of the Riverhead soils—

Permeability: moderately rapid in the surface layer and

subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or near urban development.

Dwellings.—Slope is the main limitation. Land shaping or grading will help overcome the limitation. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help to control erosion at building sites.

Recreation.—Slope is the main limitation of the soil as a site for this use, especially for playgrounds. Grading or special design is necessary in some areas. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Inclusions of Charlton soils on adjacent till plains are generally suitable as sites for septic systems.

Local roads and streets.—Slope and frost action are the main limitations. Using a coarse-grained subgrade or base material will reduce frost action. Landscaping and grading will help overcome the slope.

Capability classification: none.

RuD—Riverhead-Urban land complex, 15 to 25 percent slopes. This unit is commonly on the tops and sides of ridges in river valleys and on outwash plains. It consists of very deep, well drained, moderately steep Riverhead soils and areas covered by streets, buildings, and other impervious structures. The unit consists of about 60 percent Riverhead soils, 15 percent urban land, and 25 percent other soils. The Riverhead soils and urban land are in such an intricate pattern that it was not practical to map them separately. The areas of the unit are irregular in shape and range from 50 to 200 acres.

The typical sequence, depth, and composition of the layers of the Riverhead soils are as follows—

Surface layer:
0 to 9 inches, very dark grayish brown fine sandy loam

Subsoil:
9 to 16 inches, strong brown fine sandy loam
16 to 24 inches, brown to dark brown sandy loam
24 to 30 inches, brown loamy fine sand

Substratum:
30 to 60 inches, yellowish brown and light brown very gravelly sand

Included with this soil in mapping are small areas of Udorthents, some of which have a water table near the surface. Also included are Haven, Charlton, Wethersfield, Fredon, and Rippowam soils. The Haven soils are in river valleys and on outwash plains. The Charlton and Wethersfield soils are on adjacent glacial till uplands. The Fredon soils are on lower areas of the plains. The Rippowam soils are on adjacent flood plains. The areas of included soils are up to 5 acres each.

Major properties of the Riverhead soils—

Permeability: moderately rapid in the surface layer and subsoil; very rapid in the substratum
Available water capacity: moderate
Soil reaction: extremely acid to moderately acid in the surface layer and subsoil; very strongly acid to neutral in the substratum
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: more than 6 feet
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or near urban development.

Dwellings.—Slope is the main limitation. Special design or shaping or grading will help overcome the limitation. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help to control erosion at building sites.

Recreation.—Slope is the main limitation of the soil as a site for this use, especially for playgrounds. Grading or special design is necessary in some areas. Irrigation or mulch is required on some recreation areas to maintain the plant cover during droughty periods.

Septic tank absorption fields.—Slope is a major limitation, and poor filtering in this soil causes a hazard of ground-water contamination in areas used as sites for septic systems. Extensive alterations are required to overcome this limitation. Slope limits the inclusions of Charlton soils on adjacent till plains.

Capability classification: none.

Sa—Sloan silt loam. This soil is deep, nearly level, and very poorly drained. It is on flood plains of the larger streams in the county. The areas are commonly long and narrow and range mainly from 10 to 50 acres. Slopes are less than 1 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 8 inches, very dark gray silt loam
- 8 to 22 inches, very dark gray silty clay loam

Subsoil:
- 22 to 45 inches, dark gray silt loam and brown mottles

Substratum:
- 45 to 60 inches, very dark grayish brown very fine sandy loam

Included with this soil in mapping are small areas of Fluvaquents, Medisaprists, and Alden, Ipswich, and Rippowam soils. The Fluvaquents and Medisaprists are in freshwater marshes on flood plains. The Alden soils are at the edge of the unit. The Ipswich soils are in bogs and depressional areas. The Rippowam soils are on the slightly higher parts of the flood plains. The areas of included soils are up to 5 acres each and make up about 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer; moderate or moderately slow in the subsoil and substratum
Available water capacity: high
Soil reaction: moderately acid to neutral in the surface layer; slightly acid to mildly alkaline in the subsoil and substratum
Surface runoff: very slow
Erosion hazard: none
Depth to the water table: surface to 1 foot below the surface (November to June)
Depth to bedrock: more than 60 inches
Flooding: brief (November to June)

Use.—Most areas of this unit are wooded. Some are retention areas for municipal water. Where drained and protected from flooding, this soil is classified as prime farmland.

Dwellings.—Flooding and prolonged periods of wetness are the major limitations. The common inclusions in the unit have limitations that are as severe as those in this Sloan soil. Some adjacent soils on higher uplands, such as Watchaug and Cheshire soils, have fewer, less severe limitations for dwellings.

Local roads and streets.—Low strength, wetness, and flooding are the major limitations. Raised fill and a suitable subgrade will help overcome the limitations.

Septic tank absorption fields.—Prolonged periods of wetness and flooding and slow percolation are the major limitations. Some adjacent areas of Cheshire soils on uplands are less limited for conventional septic systems.

Recreation.—Flooding and the prolonged periods during which water is at or on the surface are the main limitations.

Woodland.—The potential productivity of this soil for pin oak is moderately high. The flooding and periods of wetness cause seedling mortality and windthrow, and they limit the use of equipment.

Hay and pasture.—This soil is well suited to pasture. Flooding causes crop damage in some years and, along with seasonal wetness, limits the practical grazing period. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Capability classification: IIIw.

Ur—Udorthents, refuse substratum. This unit consists of nearly level to steep landfills on sandy and loamy soils. The landfills have been reworked by earthmoving and grading equipment to cover trash and other refuse. Often the refuse is partly covered or mixed with the fill material. The sides of most areas are steep, and the tops are nearly level or gently sloping. The areas are mostly rectangular or irregular in shape and range from 15 to 100 acres. Slopes range from 0 to 35 percent and are smooth and convex.

Commonly, the upper 2 to 3 feet of the soil consists of mixed layers of loamy and sandy fill material. This material is on layers of garbage and refuse that range in thickness mainly from 2 to 10 feet. Where the soil material is used mainly for daily cover, it is likely to be thinner than 2 feet. Some areas of this unit were sand and gravel pits, and others have been excavated and filled using the original soil material.

The remaining active landfills generally have no plant cover. Older or abandoned landfills are covered by various grasses, weeds, and shrubs.

Onsite investigation is needed to determine the suitability of this unit for any use.

Capability classification: none.

Us—Udorthents, smoothed. This unit consists of very deep, excessively drained to moderately well drained soils that have been cut and filled. It is mainly in and near urban areas. The areas commonly are rectangular and range from 5 to 100 acres. Slopes are mainly from 6 to 15 percent, but the range is from 0 to

35 percent and the steeper parts are on the sides of the unit. The fill material on this unit is mainly more than 20 inches thick and ranges from silt loam to sand. The content of rock fragments ranges from 0 to 60 percent.

Included with this unit in mapping are small areas of Udorthents that have a wet substratum, urban land, rock outcrop, and Riverhead, Wethersfield, Hollis, Wallington, and Alden soils. The soils are near areas where the fill material is thin. The rock outcrop is in areas that have been deeply cut. The Udorthents that have a wet substratum are over somewhat poorly drained to very poorly drained soils. The included areas are up to 3 acres each and make up about 15 to 25 percent of the unit.

Onsite investigation is needed to determine the suitability of this unit for any use.

Capability classification: none.

Uw—Udorthents, wet substratum. This unit consists of somewhat poorly drained to very poorly drained soils that have been altered mainly by filling. The unit is mainly in low areas, such as depressions, drainageways, and tidal marshes. The texture of the fill ranges from sand to silt loam. The areas commonly are rectangular and range from 5 to 50 acres. Slopes range from 0 to 15 percent. The fill material on this unit is mainly more than 20 inches thick, and much of it is manmade material.

Included with this unit in mapping are small areas of better drained Udorthents, areas of urban land and rock outcrop, and areas of Hinckley, Paxton, Palms, Sloan, and Rippowam soils. The included areas are up to 3 acres each and make up about 20 percent of the unit.

Onsite investigation is needed to determine the suitability of this unit for any use.

Capability classification: none.

Ux—Urban land. This unit consists of areas where at least 50 percent of the surface is covered by buildings, parking lots, or other impervious structures. Most areas are nearly level, but a few small areas are gently sloping. The areas range from 5 to 600 acres.

Included with this unit in mapping are areas of Udorthents and small areas of Riverhead, Yalesville, and Holyoke soils around and between structures.

Capability classification: none.

Wa—Wallington silt loam. This soil is very deep, nearly level, and somewhat poorly drained. It is on lake plains adjacent to perennial streams. The areas are commonly oval and range from 10 to 50 acres. Slope is less than 1 percent.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches, very dark grayish brown silt loam

Subsurface layer:
4 to 10 inches, gray silt loam

Subsoil:
10 to 14 inches, reddish gray silt loam and strong brown mottles
14 to 40 inches, firm and brittle, reddish brown silt loam and brown and pale brown mottles

Substratum:
40 to 60 inches, dark brown to brown varved silt loam and fine sandy loam

Included with this soil in mapping are small areas of Alden, Sloan, and Watchaug soils. The Alden soils are on nearby till plains. The Sloan soils are on flood plains near the streams. The Watchaug soils are on adjacent till plains. The areas of included soils are up to 5 acres each and make up 10 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface and subsurface layers; slow in the subsoil and substratum
Available water capacity: high
Soil reaction: very strongly acid to neutral in the surface layer, very strongly acid to moderately acid in the subsurface layer, and strongly acid to slightly acid in the subsoil and substratum
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: 6 inches to 1.5 feet (January to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this map unit are woodland. Where drained, this soil is classified as prime farmland.

Woodland.—The potential productivity of this soil for northern red oak is moderate. Seasonal wetness limits the use of equipment and causes seedling mortality. It also restricts rooting, causing a hazard of windthrow.

Hay and pasture.—This soil is well suited to hay and pasture. Rotation grazing, restricted grazing during wet periods, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Wetness is the main limitation of the soil as a site for dwellings, especially those with basements. Using subsurface drains around footings and foundations and sealing basements will reduce the hazards caused by wetness. Grading and landscaping will divert runoff from the dwelling, further reducing wetness.

Septic tank absorption fields.—Seasonal wetness and slow percolation are the main limitations. Installing a drainage system around the filter field and using diversions to intercept runoff from higher areas will reduce wetness. Enlarging the filter field or the trenches below the distribution lines will increase the rate of absorption of effluent.

Local roads and streets.—Seasonal wetness and frost action are the main limitations. Constructing roads on raised fill material that includes a layer of coarse-grained base material will reduce these limitations.

Recreation.—Seasonal wetness is the main limitation. A subsurface drainage system and diversions to remove runoff from higher areas will reduce wetness.

Capability classification: IIIw.

Wc—Watchaug fine sandy loam. This soil is very deep, nearly level, and moderately well drained. It is on till plains and in depressions on bedrock-controlled uplands. The areas are commonly oblong and range from 10 to 50 acres. Slopes range from 0 to 3 percent.

Typically, the surface of this soil is covered by a 2-inch-thick layer of leaf litter. The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 5 inches, dark reddish brown fine sandy loam

Subsoil:
- 5 to 15 inches, reddish brown gravelly fine sandy loam and 15 percent rock fragments
- 15 to 21 inches, mottled, reddish brown gravelly fine sandy loam and 20 percent rock fragments

Substratum:
- 21 to 62 inches, reddish brown gravelly fine sandy loam and 20 percent rock fragments

Bedrock:
- 62 inches, weak red conglomerate

Included with this soil in mapping are small areas of Alden, Cheshire, and Wethersfield soils. The Alden soils are in depressions and along drainageways. The Cheshire and Wethersfield soils are on ridges above this Watchaug soil. The areas of included soils in the unit make up 10 to 15 percent of the unit and are up to 5 acres each.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; moderate or moderately rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid in the surface layer and subsoil; very strongly acid to slightly acid in the substratum
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: 1.5 to 2.5 feet (November to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are woodland. Some are idle. This soil is classified as prime farmland.

Woodland.—The potential productivity of this soil for eastern white pine is high. There are few or no limitations for woodland management.

Hay and pasture.—This soil is well suited to hay and pasture. Rotation grazing, restricted grazing during wet periods, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Wetness is the main limitation of the soil as a site for dwellings, especially those with basements. Using subsurface drains around footings and foundations and sealing basements will reduce the hazards caused by wetness. Grading and landscaping will divert runoff from the dwelling, further reducing wetness.

Septic tank absorption fields.—Seasonal wetness is the main limitation. Installing a drainage system around the filter field and using diversions to intercept runoff from higher areas will reduce wetness.

Local roads and streets.—Frost action is the main limitation. A layer of coarse-grained base material will reduce the limitation.

Recreation.—Seasonal wetness is the main limitation. A subsurface drainage system and diversions to remove runoff from higher areas will reduce wetness.

Capability classification: IIw.

WeA—Wethersfield gravelly silt loam, 0 to 3 percent slopes. This soil is very deep, nearly level, and well drained. It is on ridgetops and foot slopes. The areas are irregularly shaped and range from 100 to 300 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:
- 13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:

22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this soil in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges on adjacent outwash areas. The Wallington soils are slightly lower on the landscape than this Wethersfield soil. The areas of included soils are up to 5 acres each and make up 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this map unit are idle. Some are woodland, and some are used for community development. This soil is classified as prime farmland.

Woodland.—The potential productivity of this soil for northern red oak is moderately high. Seasonal wetness restricts rooting, causing a hazard of windthrow.

Hay and pasture.—This soil is very well suited to hay and pasture. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Wetness is the main limitation of the soil as a site for dwellings, especially those with basements. Using subsurface drains around footings and foundations and sealing basements will reduce the hazards caused by wetness.

Septic tank absorption fields.—Slow percolation is the main limitation. Enlarging the filter field or the trenches below the distribution lines will increase the rate of absorption of effluent.

Local roads and streets.—Seasonal wetness and frost action are the main limitations. Constructing roads on raised fill material that includes a layer of coarse-grained base material will reduce these limitations.

Recreation.—Slow percolation and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Capability classification: I.

WeB—Wethersfield gravelly silt loam, 3 to 8 percent slopes. This soil is very deep, gently sloping, and well drained. It is on ridgetops and foot slopes. The areas are irregularly shaped and range from 75 to 150 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:

13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:

22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this soil in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges on adjacent outwash areas. The Wallington soils are slightly lower on the landscape than this Wethersfield soil. Also included are more sloping areas and eroded areas. The areas of included soils are up to 5 acres each and make up 15 to 20 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: medium
Erosion hazard: slight
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this map unit are woodland. Some are used for community development, and some are pasture. This soil is classified as prime farmland.

Woodland.—The potential productivity of this soil for northern red oak is moderately high. Seasonal wetness restricts rooting, causing a hazard of windthrow.

Hay and pasture.—This soil is well suited to hay and pasture. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Wetness is the main limitation of the soil as a site for dwellings, especially those with basements. Using subsurface drains around footings and foundations and sealing basements will reduce the hazards caused by wetness.

Septic tank absorption fields.—Slow percolation is the main limitation. Enlarging the filter field or the trenches below the distribution lines will increase the rate of absorption of effluent.

Local roads and streets.—Seasonal wetness and frost action are the main limitations. Constructing roads on raised fill material that includes a layer of coarse-grained base material will reduce these limitations.

Recreation.—Slow percolation and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Capability classification: IIe.

WeC—Wethersfield gravelly silt loam, 8 to 15 percent slopes. This soil is very deep, strongly sloping, and well drained. It is on ridgetops, the sides of ridges, and the upper parts of foot slopes. The areas are irregularly shaped and range from 25 to 100 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:

13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:

22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this soil in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges on adjacent outwash areas. The Wallington soils are slightly lower on the landscape than this Wethersfield soil. Also included are more sloping areas and eroded areas and areas that are moderately deep to bedrock. The areas of included soils are up to 5 acres each and make up 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum

Available water capacity: moderate

Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum

Surface runoff: medium

Erosion hazard: moderate

Depth to the water table: 1.5 to 2.5 feet (February to April)

Depth to bedrock: more than 60 inches

Use.—Most areas of this map unit are woodland. Some are used for community development.

Woodland.—The potential productivity of this soil for northern red oak is moderately high. Seasonal wetness restricts rooting, causing a hazard of windthrow.

Hay and pasture.—This soil is well suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Wetness and slope are the main limitations. Using subsurface drains around footings and foundations and sealing basements will reduce the hazards caused by wetness. Special design helps overcome the slope. Maintaining the plant cover and using temporary erosion-control structures will help control erosion at building sites (fig. 2).

Septic tank absorption fields.—Slow percolation and slope are the main limitations. Enlarging the filter field or the trenches below the distribution lines will increase the rate of absorption of effluent. Drop boxes or other structures will help ensure even distribution of effluent from a system on the slope.

Local roads and streets.—Seasonal wetness, slope, and frost action are the main limitations. Constructing roads on raised fill material that includes a layer of coarse-grained base material will reduce the wetness and frost action. Special design will help overcome the slope.

Recreation.—Slow percolation and small stones in and on the soil are the main limitations. A sandy fill will cover the stones.

Capability classification: IIIe.

WeD—Wethersfield gravelly silt loam, 15 to 25 percent slopes. This soil is very deep, moderately steep, and well drained. It is on the sides of ridges and hills. The areas are irregularly shaped and range from 5 to 75 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

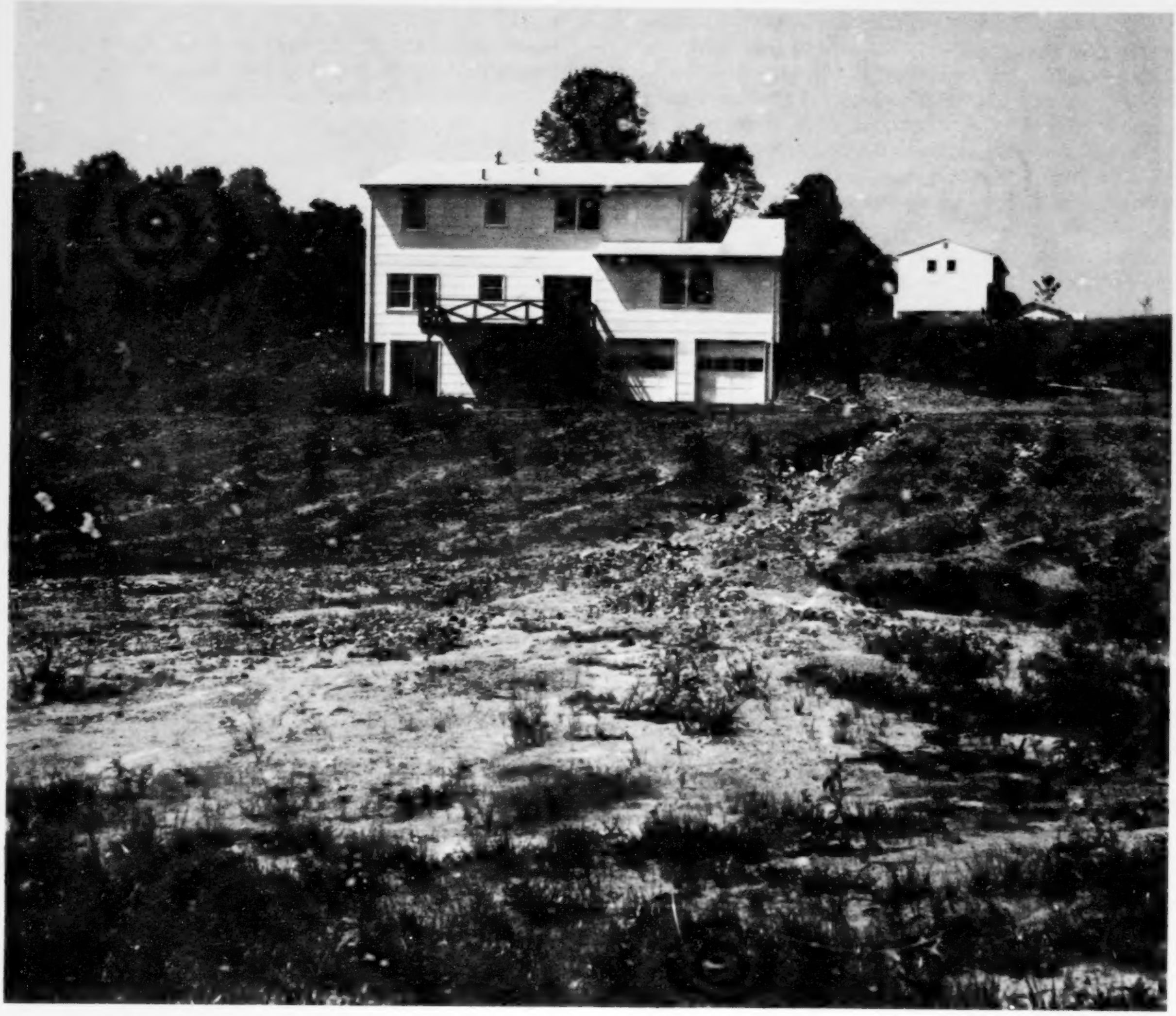


Figure 2.—Erosion is a hazard during construction on Wethersfield gravelly silt loam, 8 to 15 percent slopes.

Surface layer:

0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:

13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:

22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this unit in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils.

The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges on adjacent outwash areas. The Wallington soils are slightly lower on the landscape than this Wethersfield soil. Also included are more sloping areas and eroded areas and areas that are moderately deep to bedrock. The areas of included soils are up to 5 acres each and make up 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this map unit are woodland.

Woodland.—The potential productivity of this soil for northern red oak is moderately high. Seasonal wetness restricts rooting, causing a hazard of windthrow. Slope limits the use of equipment.

Hay and pasture.—This soil is moderately suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Rotation grazing, proper stocking rates, weed control, and fertilizer will help increase forage yields.

Dwellings.—Slope is the main limitation. Special design helps overcome the slope.

Septic tank absorption fields.—Slow percolation and slope are the main limitations. Enlarging the filter field or the trenches below the distribution lines will increase the rate of absorption of effluent. Drop boxes or other structures will help ensure even distribution of effluent from a system on the slope.

Local roads and streets and recreation.—Slope is the main limitation. Special design of roads and streets will help overcome the limitation for these uses.

Capability classification: IVe.

WuB—Wethersfield-Urban land complex, 2 to 8 percent slopes. This unit is on ridgetops and foot slopes on till plains. It consists of very deep, gently sloping, well drained Wethersfield soils and areas covered by buildings, streets, and other impervious structures. The urban land and Wethersfield soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 50 percent Wethersfield soils, 25 percent urban land, and 25 percent other soils. The areas of the unit are irregular in shape and range mainly from 150 to 300 acres.

The typical sequence, depth, and composition of the layers of the Wethersfield soils are as follows—

Surface layer:
0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:
13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:
22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this unit in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges in adjacent outwash areas. The Wallington soils are slightly lower on the landscape than these Wethersfield soils. Also included are areas of cut and filled Udorthents adjacent to urban development. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings.—Seasonal wetness is the main limitation. Using a subsurface drainage system around footings and foundations and sealing the foundation will reduce wetness.

Septic tank absorption fields.—Slow percolation in the substratum is the main limitation. Enlarging the absorption field or the trenches below the distribution lines will increase the rate of absorption of effluent.

Local roads and streets.—Seasonal wetness and frost action are the main limitations. Constructing roads on raised fill that contains a layer of coarse-grained material will reduce wetness and frost action.

Recreation.—Small stones in and on the soil and slow percolation in the substratum are the main limitations.

Capability classification: none.

WuC—Wethersfield-Urban land complex, 8 to 15 percent slopes. This unit is on the sides and tops of ridges and foot slopes on till plains. It consists of very deep, strongly sloping, well drained Wethersfield soils and areas covered by buildings, streets, and other impervious structures. The urban land and Wethersfield soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 60 percent Wethersfield soils, 20 percent urban land, and 20 percent other soils. The areas of the unit are irregular in shape or rectangular and range mainly from 50 to 150 acres.

The typical sequence, depth, and composition of the layers of the Wethersfield soils are as follows—

Surface layer:
0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:
13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:
22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this unit in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges in adjacent outwash areas. The Wallington soils are slightly lower on the landscape than these Wethersfield soils. Also included are areas of cut and filled Udorthents adjacent to urban development. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings.—Seasonal wetness and slope are the main limitations. Using a subsurface drainage system around footings and foundations and adequately sealing the foundation will reduce wetness. Special design will help overcome the slope. Maintaining the plant cover and using temporary erosion-control structures will help control erosion at building sites.

Septic tank absorption fields.—Slow percolation in the substratum is the main limitation. Enlarging the absorption field or the trenches below the distribution lines will increase the rate of absorption of effluent.

Local roads and streets.—Seasonal wetness, slope, and frost action are the main limitations. Constructing roads on raised fill that contains a layer of coarse-grained material will reduce wetness and frost action. Land shaping or grading will help overcome the slope.

Recreation.—Small stones in and on the soil, slope, and slow percolation in the substratum are the main limitations.

Capability classification: none.

WuD—Wethersfield-Urban land complex, 15 to 25 percent slopes. This unit is on the sides and tops of ridges on till plains. It consists of very deep, moderately steep, well drained Wethersfield soils and areas covered by buildings, streets, and other impervious structures. The urban land and Wethersfield soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 65 percent Wethersfield soils, 15 percent urban land, and 20 percent other soils. The areas of the unit are irregular in shape or rectangular and range mainly from 10 to 75 acres.

The typical sequence, depth, and composition of the layers of the Wethersfield soils are as follows—

Surface layer:
0 to 13 inches, dark brown gravelly silt loam and 15 percent rock fragments

Subsoil:
13 to 22 inches, reddish brown gravelly loam and 15 percent rock fragments

Substratum:

22 to 60 inches, mottled, firm and dense, reddish brown gravelly fine sandy loam and 15 percent rock fragments

Included with this soil in mapping are small areas of Cheshire, Charlton, Wallington, and Riverhead soils. The Cheshire and Charlton soils are on ridgetops and foot slopes. The Riverhead soils are on ridges in adjacent outwash areas. The Wallington soils are slightly lower on the landscape than these Wethersfield soils. Also included are areas of cut and filled Udorthents adjacent to urban development. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate in the surface layer and subsoil; slow or very slow in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid or strongly acid in the surface layer and subsoil; very strongly acid to moderately acid in the substratum
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: 1.5 to 2.5 feet (February to April)
Depth to bedrock: more than 60 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings.—Slope is the main limitation. Special design will help overcome the slope. Maintaining the plant cover, using temporary erosion-control structures, and quickly establishing a plant cover after construction will help control erosion at building sites.

Septic tank absorption fields.—Slope and slow percolation in the substratum are the main limitations. Enlarging the absorption field or the trenches below the distribution lines will increase the rate of absorption of effluent. Drop boxes or other structures that ensure even distribution of effluent will increase the effectiveness of a septic system on the slope.

Local roads and streets.—Slope is the main limitation. Land shaping or grading will help overcome the slope.

Recreation.—Slope is the main limitation.

Capability classification: none.

YaB—Yalesville sandy loam, 2 to 8 percent slopes. This soil is moderately deep, gently sloping, and well drained. It is on hilltops on till plains. The areas are oblong and range mainly from 50 to 200 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 4 inches, dark brown sandy loam and 10 percent rock fragments
4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:

10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments
16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:

27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:

30 inches, red thinly bedded and fine grained sandstone

Included with this soil in mapping are areas of Cheshire, Holyoke, and Wethersfield soils. The Holyoke soils are on shoulder slopes and ridgetops. The Cheshire and Wethersfield soils are on ridgetops. Also included are areas of urban land in small residential developments. The areas of included soils are up to 5 acres each and make up 10 to 15 percent of the unit.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: slow
Erosion hazard: slight
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are used for community development. Some are used for watersheds or are idle. This soil is classified as prime farmland.

Hay and pasture.—This soil is very well suited to hay and pasture. Weed control, rotation grazing, and fertilizer will increase forage yields.

Woodland.—The potential productivity of this soil for northern red oak is moderate. The depth to bedrock restricts rooting and causes a windthrow hazard.

Dwellings, septic tank absorption fields, and local roads and streets.—The depth to bedrock is the main limitation. The limitation is more severe for dwellings with basements than for those without basements. Building above the rock and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Inclusions of Cheshire soils in the unit do not have limitations for septic systems.

Recreation.—Small stones in and on the soil and slope are limitations for playgrounds. Placing playgrounds in the less sloping areas of the unit and adding fill to cover the stones will reduce these limitations.

Capability classification: IIe.

YaC—Yalesville sandy loam, 8 to 15 percent slopes. This soil is moderately deep, strongly sloping, and well drained. It is on hilltops and side slopes on till plains. The areas are irregular in shape or oblong and range mainly from 25 to 150 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 4 inches, dark brown sandy loam and 10 percent rock fragments

4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:

10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments

16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:

27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:

30 inches, thinly bedded red sandstone

Included with this soil in mapping are areas of Cheshire, Hollis, Holyoke, and Wethersfield soils. The Holyoke and Hollis soils are on shoulder slopes and ridgetops. The Cheshire and Wethersfield soils are on ridgetops. Also included are areas of urban land in small residential developments. The areas of included soils are up to 5 acres each and make up 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum

Available water capacity: moderate

Soil reaction: very strongly acid to moderately acid throughout

Surface runoff: medium

Erosion hazard: moderate

Depth to the water table: more than 6 feet

Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are used for community development. Some are in perennial grasses or woodland.

Hay and pasture.—This soil is well suited to hay and pasture. Erosion is a hazard if the pasture is overgrazed. Weed control, rotation grazing, and fertilizer will increase forage yields.

Woodland.—The potential productivity of this soil for northern red oak is moderate. The depth to bedrock restricts rooting and causes a windthrow hazard.

Dwellings, septic tank absorption fields, and local roads and streets.—The depth to bedrock is the main limitation. The limitation is more severe for dwellings with basements than for those without basements. Building above the rock and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Slope is an additional limitation for local roads and streets. Inclusions of Cheshire soils in the unit do not have limitations for septic systems.

Recreation.—Small stones in and on the soil and slope are limitations for playgrounds. Placing playgrounds in the less sloping areas of the unit and adding fill to cover the stones will reduce these limitations.

Capability classification: IIIe.

YaD—Yalesville sandy loam, 15 to 25 percent slopes. This soil is moderately deep, moderately steep, and well drained. It is on hilltops and side slopes on till plains. The areas are irregular in shape and range mainly from 25 to 100 acres.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 4 inches, dark brown sandy loam and 10 percent rock fragments

4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:

10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments

16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:

27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:

30 inches, thinly bedded red sandstone

Included with this soil in mapping are areas of Cheshire, Hollis, Holyoke, and Wethersfield soils. The Holyoke and Hollis soils are on shoulder slopes and ridgetops. The Cheshire and Wethersfield soils are on ridgetops. Also included are areas of urban land in small residential developments. The areas of included soils are up to 5 acres each and make up 15 to 25 percent of the unit.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are woodland. Some are in perennial grasses or herbaceous plants. A few areas are in community development.

Hay and pasture.—This soil is moderately suited to hay and pasture. Erosion is a hazard during seeding or if the pasture is overgrazed. Weed control, rotation grazing, and fertilizer will increase forage yields.

Woodland.—The potential productivity of this soil for northern red oak is moderate. The depth to bedrock restricts rooting and causes a windthrow hazard. Slope limits the use of equipment.

Dwellings and septic tank absorption fields.—The depth to bedrock and slope are the main limitations. The depth to rock is a more severe limitation for dwellings with basements than for those without basements. Building above the rock and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Inclusions of less sloping Cheshire soils in the unit do not have limitations for septic systems.

Local roads and streets.—Slope and the depth to bedrock are the main limitations. Special design and placement will help overcome the limitations.

Recreation.—Slope is the main limitation, especially for playgrounds and camping and picnic areas.

Capability classification: IVe.

YuB—Yalesville-Urban land complex, 2 to 8 percent slopes. This unit is on ridgetops on till plains. It consists of moderately deep, gently sloping, well drained Yalesville soils and areas covered by buildings, streets, and other impervious structures. The urban land and Yalesville soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 60 percent Yalesville soils, 20 percent urban land, and 20 percent other soils. The areas of the unit are irregular in shape or rectangular and range mainly from 50 to 200 acres.

The typical sequence, depth, and composition of the layers of the Yalesville soils are as follows—

Surface layer:

0 to 4 inches, dark brown sandy loam and 10 percent rock fragments
4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:

10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments
16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:

27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:

30 inches, red thinly bedded and fine grained sandstone

Included with this unit in mapping are areas of Udorthents and Cheshire, Hollis, Watchaug, and Wethersfield soils. The Udorthents are in cut and filled areas, some of which have a water table near the surface. The Hollis soils are on side slopes. The Cheshire and Wethersfield soils are on hilltops and the upper parts of side slopes. The Watchaug soils are on lower ridges and knolls. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum

Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: medium
Erosion hazard: moderate
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings, septic tank absorption fields, and local roads and streets.—The depth to bedrock in the Yalesville soils is the main limitation. The limitation is more severe for dwellings with basements than for those without basements. Building above the rock and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Inclusions of Cheshire soils in the unit do not have limitations for septic systems.

Recreation.—Small stones in and on the soil and slope are limitations for playgrounds. Placing playgrounds in the less sloping areas of the unit and adding fill to cover the stones will reduce these limitations.

Capability classification: none.

YuC—Yalesville-Urban land complex, 8 to 15 percent slopes. This unit is on ridgetops on till plains. It consists of moderately deep, strongly sloping, well drained Yalesville soils and areas covered by buildings, streets, and other impervious structures. The urban land and Yalesville soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 55 percent Yalesville soils, 20 percent urban land, and 25 percent other soils. The areas of the unit are mainly rectangular and range mainly from 25 to 100 acres.

The typical sequence, depth, and composition of the layers of the Yalesville soils are as follows—

Surface layer:
0 to 4 inches, dark brown sandy loam and 10 percent rock fragments
4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:
10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments
16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:
27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:
30 inches, red thinly bedded and fine grained sandstone

Included with this unit in mapping are areas of Udorthents and Cheshire, Holyoke, Hollis, Watchaug, and Wethersfield soils. The Udorthents are in cut and filled areas, some of which have a water table near the surface. The Hollis and Holyoke soils are on side slopes. The Cheshire and Wethersfield soils are on hilltops and the upper parts of side slopes. The Watchaug soils are on lower ridges and knolls. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: rapid
Erosion hazard: severe
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings, septic tank absorption fields, and local roads and streets.—The depth to bedrock is the main limitation. The limitation is more severe for dwellings with basements than for those without basements. Building above the rock and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Slope is an additional limitation for local roads and streets. Inclusions of Cheshire soils in the unit do not have limitations for septic systems.

Recreation.—Small stones in and on the soil and slope are limitations for playgrounds. Placing playgrounds in the less sloping areas of the unit and adding fill to cover the stones will reduce these limitations.

Capability classification: none.

YuD—Yalesville-Urban land complex, 15 to 25 percent slopes. This unit is on ridgetops on till plains. It consists of moderately deep, moderately steep, well drained Yalesville soils and areas covered by buildings, streets, and other impervious structures. The urban land and Yalesville soils are so intricately mixed that it was not practical to map them separately. The unit consists of about 60 percent Yalesville soils, 15 percent urban land, and 25 percent other soils. The areas of the unit are mainly rectangular and range mainly from 15 to 150 acres.

The typical sequence, depth, and composition of the layers of the Yalesville soils are as follows—

Surface layer:
- 0 to 4 inches, dark brown sandy loam and 10 percent rock fragments
- 4 to 10 inches, dark reddish brown sandy loam and 10 percent rock fragments

Subsoil:
- 10 to 16 inches, reddish brown gravelly loam and 20 percent rock fragments
- 16 to 27 inches, red gravelly loam and 25 percent rock fragments

Substratum:
- 27 to 30 inches, red extremely channery loam and 80 percent sandstone channers

Bedrock:
- 30 inches, red thinly bedded and fine grained sandstone

Included with this unit in mapping are areas of Udorthents and Cheshire, Holyoke, Hollis, Watchaug, and Wethersfield soils. The Udorthents are in cut and filled areas, some of which have a water table near the surface. The Hollis and Holyoke soils are on side slopes. The Cheshire and Wethersfield soils are on hilltops and the upper parts of side slopes. The Watchaug soils are on lower ridges and knolls. The areas of included soils are up to 5 acres each.

Major soil properties—

Permeability: moderate or moderately rapid in the surface layer and subsoil; moderately rapid in the substratum
Available water capacity: moderate
Soil reaction: very strongly acid to moderately acid throughout
Surface runoff: very rapid
Erosion hazard: very severe
Depth to the water table: more than 6 feet
Depth to bedrock: 20 to 40 inches

Use.—Most areas of this unit are in or adjacent to areas of urban development.

Dwellings, roads and streets, and septic tank absorption fields.—The depth to bedrock and slope are the main limitations. The depth to rock is a more severe limitation for dwellings with basements than for those without basements. Special design, building above the rock, and landscaping with additional fill as needed will help to overcome the limitation. Poor filtering is an additional limitation for septic systems, and contamination of the ground water is a hazard if the soil is used as a site for septic systems. Inclusions of less sloping Cheshire soils in the unit do not have limitations for septic systems.

Recreation.—Slope is the main limitation, especially for playgrounds and camping and picnic areas.

Capability classification: none.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. Identification of prime farmland is a major step in meeting the Nation's needs for food and fiber.

The U.S. Department of Agriculture defines prime farmland as the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmland produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment.

An area identified as prime farmland must be used for producing food or fiber or must be available for those uses. Thus, urban and built-up land and water areas are not classified as prime farmland.

The general criteria for prime farmland are as follows: a generally adequate and dependable supply of moisture from precipitation or irrigation, favorable temperature and growing-season length, acceptable levels of acidity or alkalinity, few or no rocks, and permeability to air and water. Prime farmland is not excessively erodible, is not saturated with water for long periods, and is not flooded during the growing season. The slope range is mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

The survey area contains about 23,128 acres of prime farmland. That acreage makes up about 20 percent of the total acreage in the survey area.

The soil map units that make up prime farmland in the survey area are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4, and the location of each unit is shown on the detailed soil maps at the back of this publication. The soil properties and characteristics that affect use and management of the units are described in the section "Detailed Soil Map Units."

Some soils in table 5 are classified as prime farmland if certain limitations of the soil are overcome. The measures needed to overcome the limitations of such soils are given in parentheses after the name of the map unit.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Landscaping

By Laura A. Zaimes, Soil Conservation Service, and William J. Sanok, Paul Trader, and Winifred Strakosch, Rockland County Cooperative Extension Service.

This section gives the suitability of the soils for various types of trees, shrubs, flowers, fruits and vegetables, and pasture and other crops. It also describes some of the suitable management practices, and it explains the system of land capability classification used by the Soil Conservation Service.

Vegetables, Flowers, and Fruits

Table 6 rates the soils in the survey area according to their suitability for perennial flowers, annual flowers and vegetables, and tree fruits and small fruits. The ratings are based on productivity as reported by agronomists, extension agents, and soil conservationists.

The soils are given ratings of very good, good, fair, poor, or very poor, according to the suitability for each crop.

A rating of very good indicates the soil has few or no limitations or management concerns for the proposed use and is capable of sustaining high yields of fruit, vegetables, or flowers. Soils rated good have some minor limitations, such as a slightly lower available water capacity or slightly shallower rooting depth than those rated very good. A fair rating indicates the soil has limitations that require special management needs such as irrigation or drainage to attain a high level of production. A rating of poor indicates the soil has poor drainage, low available water capacity, moderately steep slopes, or other limitations that are somewhat difficult to overcome. A rating of very poor indicates the soil has major limitations such as very poor drainage, steep slopes, or very low available water capacity—all of which are difficult to overcome sufficiently for vegetable and fruit production.

Some soils in the table are not rated. This indicates either that they are not suited to the certain group of crops or the crops are not grown on these soils.

Soils with a low rating can often be made productive by using proper management, such as drainage, irrigation, or addition of organic matter. Even soils with a very poor rating can be productive if adequately managed.

Additional information on specific soil characteristics that are important for a particular crop is given in the section "Detailed Soil Map Units." Specific information on soil types and management can be obtained from the Rockland County Soil and Water Conservation District. Specific information for crop production, soil testing, pH, and nutrient requirements can be obtained from the Rockland County Cooperative Extension Service.

Garden and fruit crops and flowers generally are suited to loamy, permeable, well drained soils that have a medium to high available water capacity and good tilth and that warm up early in the spring, such as Cheshire and Wethersfield soils.

Most garden crops thrive in soil that has a reaction of slightly acid to neutral. Most of the soils in Rockland County, however, are moderately acid to slightly acid. This acidity can be changed by adding lime at rates based on the results of a soil test.

A number of management practices are required to obtain long-term, optimum productivity of fruit, vegetables, or flowers. These include proper planting and seeding rates, erosion control where required, and use of high-yielding and pest-resistant plant varieties. Also included are appropriate and timely tillage, weed control, and control of diseases and harmful insects. Irrigation is required on some soils during dry periods. Fertilization and effective use of crop residue, manure, and green-manure crops also help to sustain high yields. External factors such as frost occurrence and the amount of sunlight also have a strong influence on yields.

Ornamental Trees, Shrubs, and Ground Cover

Table 7 lists some of the readily available deciduous and evergreen trees, shrubs, and ground covers that are suitable for landscaping in Rockland County. The local office of the Rockland County Cooperative Extension Service can provide a list of additional species suitable for specific locations.

Many of the soils in Rockland County have been disturbed, to some degree, during excavation for building and construction. The species listed in table 7 are generally suitable unless the soil has been severely altered. The closer the soils are to a structure, the more likely the disturbance.

In some areas the fill material brought into a construction site is different from the original soil at the site.

Improving the Soil

Most of the soils in the county require lime and additions of organic matter. Organic matter in the form of peat moss or compost will improve tilth and increase the available water capacity. Some soils require infrequent applications of soil-improving additions; others require annual additions of organic matter, lime, and fertilizer for optimum productivity.

Many construction areas contain little topsoil. Instead, there is a hard, acidic subsoil at the surface, and it cannot be tolerated by most plants and grasses. A layer of screened topsoil—at least 2 inches thick but ideally 4 to 6 inches deep—tilled into the subsoil to a depth of about 8 inches will improve the suitability for plants at such sites.

Landscape Planting Factors

Lime is needed in some acidic soils but is not needed in some shaded areas since many shade-loving plants thrive in slightly acidic soil (pH 4.5-5.5). Examples of such plants are rhododendron, holly, azalea, mountain laurel, leucothoe, andromeda, and dogwood. Mixing peat moss, humus, or compost with the soil improves the suitability of the soil for those plants.

Few landscape plants thrive in wet soils, and a subsurface drainage system will improve the suitability of a wet soil for landscaping if the soil is sufficiently permeable. Subsurface drainage is helpful to the Fredon, Wallington, and Watchaug soils in this county. Using a raised bed of loamy soil or diverting runoff from adjacent areas will help to overcome wetness on some soils.

Some soils, especially those that are sandy or have a restrictive layer, have low available water capacity. Riverhead and Hinckley soils, for instance, are sandy. Irrigation is sometimes needed on these soils, especially immediately after planting and during dry periods. Adding organic material during planting will increase the moisture-holding capacity of these soils.

Shallow soils, such as the Hollis and Holyoke soils, generally do not hold enough moisture for plants throughout the growing season. Where Paxton and Wethersfield soils have been severely graded during construction, the dense, compact subsoil is at or near the surface. Roots cannot penetrate the dense layers, and thus do not receive sufficient moisture. Frost heaving is a hazard during freeze-thaw periods. Where root-restricting layers are near the surface, the root zone can be increased by tilling topsoil or organic matter into the original soil. This will increase the moisture-holding capacity of the soil and improve the soil tilth, thus providing a better medium for root development.

A noncompacted soil with good structure and tilth consists of approximately 45 percent soil particles, 50 percent pore space, and 5 percent organic matter. When the soil is at the proper moisture content for tilling or spading, about half of the pore space is filled with water. In a highly compacted soil, the pore space has been greatly reduced by the weight of machinery or foot traffic forcing soil particles to fill the pore spaces. As a result, the soil holds less air and water and is less permeable. Compacted soils provide a poor environment for roots, but the environment can be improved by adding peat moss, decayed leaves, or compost.

Some salts occur naturally in soils and water, but the salts in fertilizers and deicers are hazardous to plants. Fertilizers contain salts which, when applied at above-normal rates, can cause damage to lawns and ornamentals. Damage from salt is a hazard where a planting is within splash distance of streets and gutters or where runoff from driveways and sidewalks accumulates. Some plants are more salt-tolerant than others; a list of the salt-tolerant and salt-sensitive trees and shrubs is available from Rockland County Cooperative Extension Service.

Site Preparation for Ornamentals, Ground Cover, and Grasses

Preparation of the soil before planting ornamentals is especially critical in urban and suburban areas where the soils have been disturbed. Some of the common site-preparation practices are: digging the planting hole twice as wide and twice as deep as the root ball; backfilling 6 inches with a mixture containing two-thirds soil and one-third organic matter, then adding the required amounts of lime and fertilizer; placing the plant at the proper depth and watering thoroughly; completing backfilling with the same mixture and leaving a slight depression for watering; and adding 2 to 4 inches of mulch cover.

The ground cover, commonly used in areas unsuitable for grasses, requires a weed-free bed before planting and requires mulch after planting and until the cover is mature. The Extension Service can provide information about the suitability of ground cover for such special conditions as extreme shade or sun or steep slopes.

Lawn grasses differ in their ability to tolerate different types of soil and shade, moisture stress, disease and pests, fertility, pH, and traffic. Kentucky bluegrasses, turf-type perennial ryegrasses, and fine fescues are the primary lawn grasses used in Rockland County. Lists of varieties and seed mixes suitable for different site conditions are available from Rockland County Cooperative Extension Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 8. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 8 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded.

The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, or *s*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations or hazards. Class V contains only the subclasses indicated by *w* or *s* because the soils in class V are subject to little or no erosion. They have other limitations or hazards that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 9. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Table 10 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed in the tables. The table gives the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, that the indicator species can produce. The larger the number, the greater the potential productivity. The number 1 indicates low productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 through 8, high; 9 through 11, very high; and 12 or more, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates steep slopes; *X*, stones or rocks on the surface; *W*, excessive water in or on the soil; *D*, restricted rooting depth caused by bedrock, hardpan, or other restrictive layer; *S*, sandy texture; and *F*, high content of rock fragments in the soil profile. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, D, S, and F.

In table 10, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that erosion can occur as a result of site preparation or following cutting operations and where the soil is exposed, for example, roads, skid trails, fire lanes, and log handling areas. Forests that are abused by fire or overgrazing are also subject to erosion. The ratings for the erosion hazard are based on the percent of the slope and on the erosion factor K shown in table 18. A rating of *slight* indicates that no particular measures to prevent erosion are needed under ordinary conditions. A rating of *moderate* indicates that erosion control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

The proper construction and maintenance of roads, trails, landings, and fire lanes will help overcome the erosion hazard.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *Slight* indicates that equipment use normally is not restricted either in kind of equipment that can be used or time of year because of soil factors. If soil wetness is a factor, equipment use can be restricted for a period not to exceed 2 months. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If soil wetness is a factor, equipment use is restricted for 2 to 6 months. A rating of *severe* indicates that equipment use is severely restricted either in kind of equipment or season of use. If soil wetness is a factor, equipment use is restricted for more than 6 months.

Choosing the most suitable equipment and timing harvesting and other management operations to avoid seasonal limitations help to overcome the equipment limitation.

Seedling mortality refers to the probability of death of naturally occurring or planted tree seedlings as influenced by kinds of soil or topographic conditions. The factors considered in rating the soils for seedling mortality are texture of the surface layer, depth and duration of the water table, rock fragments in the surface layer, rooting depth, and aspect of the slope. A rating of *slight* indicates that under usual conditions the expected mortality is less than 25 percent. A rating of *moderate* indicates that the expected mortality is 25 to 50 percent. Extra precautions are advisable. A rating of *severe* indicates that the expected mortality is more than 50 percent. Extra precautions are important. Replanting may be necessary.

The use of special planting stock and special site preparation, such as bedding, furrowing, or surface drainage, can help reduce seedling mortality.

Windthrow hazard is the likelihood of trees being uprooted (tipped over) by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions are a seasonal high water table and bedrock or a fragipan or other limiting layer. A rating of *slight* indicates that normally no trees are blown down by the wind. Strong winds may break trees but do not uproot them. A rating of *moderate* indicates that moderate or strong winds occasionally blow down a few trees during periods of soil wetness. A rating of *severe* indicates that moderate or strong winds may blow down many trees during periods of soil wetness.

The use of specialized equipment that does not damage surficial root systems during partial cutting operations can help reduce windthrow. Care in thinning or no thinning also can help reduce windthrow.

Adequate site preparation before planting the new crop can help reduce plant competition.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Common trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first tree species listed under *common trees* for a soil is the indicator species for that soil. The indicator species is the species that is common in the area and is generally the most productive on the soil. The productivity class of the indicator species is the number used for the ordination symbol.

Trees to plant are those that are suited to the soil and are planted for commercial wood production.

Recreation

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Robert E. Myers, wildlife biologist, Soil Conservation Service.

Though heavily urbanized, the county contains a diverse wildlife population that inhabit small woodlands and wetlands, some landscaped residential areas, and Harriman State Park.

Gray squirrels, raccoons, foxes, skunks, cottontail rabbits, songbirds, muskrats, ducks, and geese are common in the county. The geese are especially abundant in the fall. The county contains a few pheasants and ruffed grouse, and a few wild turkey live mainly in Harriman State Park. The population of white-tailed deer is small.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarticks, quackgrass, and ragweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, yew, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, arrowhead, pickerelweed, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, swamps, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadow vole, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, frogs, and tree swallows.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or *for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small *commercial buildings* are structures built on shallow foundations on undisturbed soil (fig. 3). The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year (fig. 4). They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Figure 3.—Urban development in the county.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil

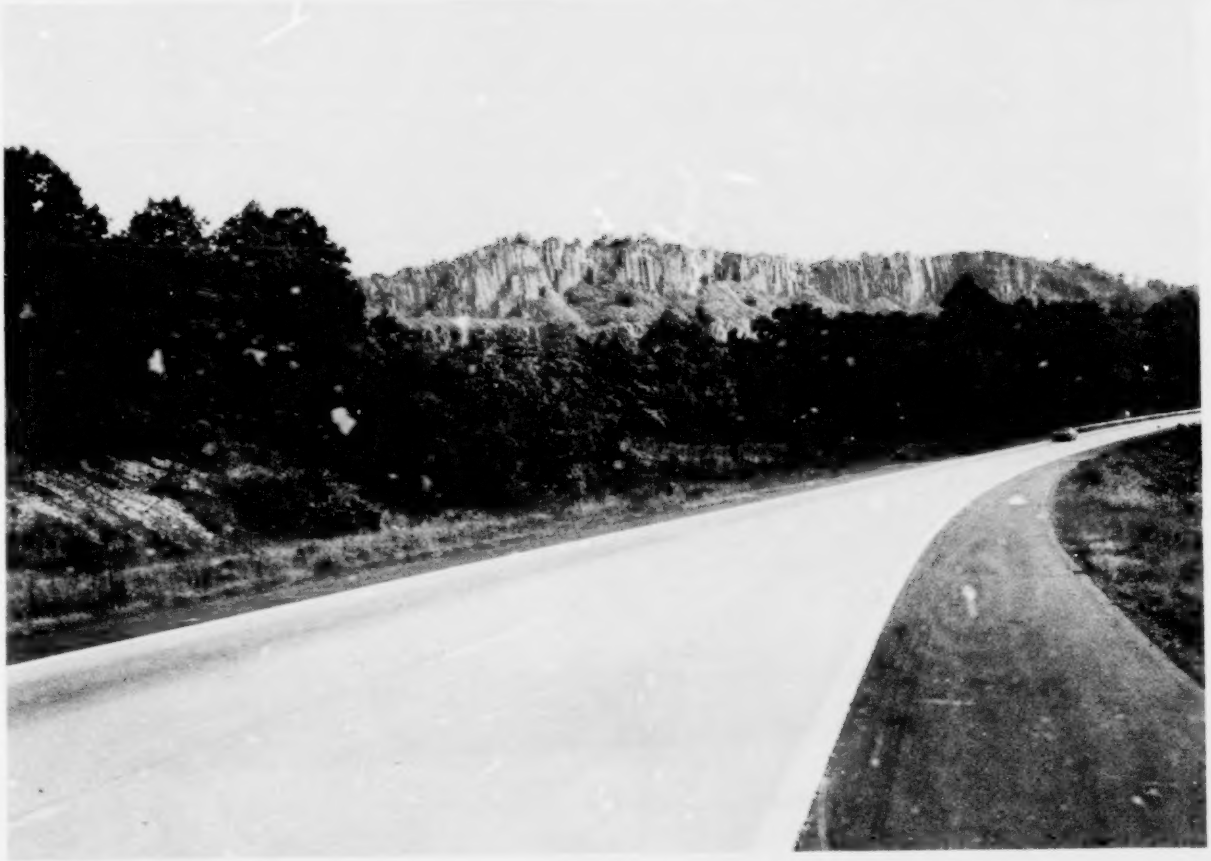


Figure 4.—A road on Charlton and Chatfield soils. Hollis soils and Rock outcrop are in the higher areas in the background.

properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

Some soils in table 19 are assigned to two hydrologic soil groups. Dual grouping is used for one of two reasons: (1) Some soils have a seasonal high water table but can be drained. In this instance the first letter applies to the drained condition of the soil and the second letter to the undrained condition. (2) In some soils that are less than 20 inches deep to bedrock, the first letter applies to areas where the bedrock is cracked and pervious and the second letter to areas where the bedrock is impervious or where exposed bedrock makes up more than 25 percent of the surface of the soil.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable period of occurrence are estimated. Frequency generally is expressed as *none*, *rare*, *occasional*, or *frequent*. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely, grayish colors or mottles in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table, that is, *perched* or *apparent*; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table—Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Properties of Geologic Deposits

By Edward Fernau, senior soil engineer, New York State Department of Transportation.

The following geologic deposits are in Rockland County: glacial till, glacial outwash, lacustrine deposits, alluvial deposits, and organic deposits. The engineering significance of each geologic deposit is influenced to a great extent by its mode of deposition, which in turn determines the texture of the material and the internal structure of the landform. The position on the landscape and the position of the water table are other influences. The geologic deposits in Rockland County are in the following categories: deep till deposits, shallow-to-rock deposits, stratified coarse-grained deposits, stratified fine-grained deposits, and organic deposits.

Deep till deposits. This material is an unstratified, highly variable mixture of particle sizes ranging from rock fragments to clay. It was scoured and transported from nearby sources by glacial ice and deposited as ground moraines or end moraines. Bedrock is generally more than 5 feet below the surface, but in some places the bedrock is closer to the surface or it outcrops along the sides of some hills. The individual rock and mineral fragments in the soil generally reflect the types of bedrock in the immediate area.

Alden, Charlton, Cheshire, Paxton, Watchaug, and Wethersfield soils are examples of soils that formed in this type of material. These soils are the most dense and compact of the unconsolidated deposits in the county. Most of the till has been subjected to the compactive weight of overriding ice. Deep till soils are on slopes ranging from nearly level to very steep, but most are nearly level to strongly sloping. Many landscapes are such that cut and fill earthwork is common at most construction projects. The soils generally provide stable, relatively incompressible foundations for engineering works. Fill material from these deposits, when properly compacted, generally provides stable embankments. Steep cut slopes, however, often are subject to surface sloughing and erosion, and the Alden soils are subject to ponding.

Shallow-to-rock deposits. This material contains a veneer of unconsolidated sediments above the bedrock. The soil commonly is 6 inches to 5 feet in thickness, but rock outcrops are common in some areas. The landforms and topography are controlled by the underlying bedrock.

Chatfield and Hollis soils formed in glacial till over bedrock of metamorphic origin. Holyoke soils formed in glacial till over basalt or diabase bedrock. Yalesville soils formed in glacial till over sandstone bedrock.

The primary engineering concerns when using this material relate to the underlying bedrock and to the ground-water conditions. The amount of fill material is limited because of the closeness of bedrock.

Stratified coarse-grained deposits. Material, mainly gravel and sand, sorted by glacial meltwater into layered deposits is in this category, as is the coarser material deposited by fluvial action. The materials mainly are on outwash plains and terraces and on the coarser parts of deltas and flood plains. In some areas the strata within these deposits are well sorted, and in some others they are poorly sorted. The size of the material ranges from cobbles to silt. The deposits mainly are loose and porous and have moderately rapid to rapid permeability. Fredon, Haven, Hinckley, and Riverhead soils formed on gravelly outwash plains and terraces. Rippowam soils formed in sandy materials over coarse-grained materials.

Coarse-grained deposits generally have high strength and low compressibility. Because they are loose and porous, most of these deposits are not highly erodible but are subject to settlement when vibrated. The Rippowam soils are subject to flooding.

These deposits have many uses as construction material. Depending on gradation, soundness, and plasticity, they may be used for (1) fill material for highway embankments, (2) fill material for parking areas and developments, (3) fill material to decrease the stress on underlying soils so that construction operations may progress, (4) subbase material for pavements, (5) wearing surfaces for driveways, parking lots, and some roads, (6) material for highway shoulders, (7) free-draining backfill for structures and pipes, (8) outside shells of dams, (9) slope-protection blankets to drain and help stabilize wet cut slopes, and (10) sources of sand and gravel.

Stratified fine-grained deposits. Two types of material are in this category: (1) lacustrine and fine-grained sediment transported by glacial meltwater and deposited in quiet preglacial lakes and ponds and (2) floodplain soils on more recent slackwater deposits. Wallington soils formed in lake-laid silt deposits over glacial till. Sloan soils are alluvial in origin and are on flood plains.

Because of their finer texture and higher moisture content, these deposits have low strength. The soils in this category that have a large amount of fine sand and silt also have low compressibility and are highly erodible and susceptible to frost action. The alluvial soils are subject to flooding.

The fine-grained deposits, especially the level ones, are difficult to use for engineering works because they usually have a high water table and are subject to ponding. Sites for embankments and heavy structures or buildings on all soils formed in these finer sediments must be investigated for strength and settlement characteristics and the effects of ground water.

Organic deposits. This type consists of soils that mainly are plant remains. In places, they contain a small amount of mineral soil. The soils are very poorly drained and are in depressions and bogs. They are ponded most of the year or are in tidal marsh areas.

Carlisle, Adrian, Palms, and Ipswich soils are examples in this category. Carlisle soils formed in deep organic material. Adrian soils are shallow to stratified coarse-grained material. Palms soils are shallow to fine-grained material. Ipswich soils are in tidal marsh areas and are subject to daily tidal inundation.

Soils formed in organic deposits are unsuited to foundations or embankments because the soils are wet, have low strength, and are highly compressible.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(10)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquept (*Aqu*, meaning water, plus *ept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquepts (*Hapl*, meaning minimal horizonation, plus *aquept*, the suborder of the Inceptisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Mollic* identifies the subgroup that has a dark colored surface horizon. An example is Mollic Haplaquepts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. An example is the Alden series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (9)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (10)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adrian Series

The Adrian series consists of very deep, very poorly drained soils formed in well decomposed organic material over sandy outwash. The sandy outwash is at a depth of 16 to 50 inches. Adrian soils are in depressional areas of outwash plains. They receive runoff from surrounding areas. Slopes range from 0 to 2 percent.

Adrian soils are similar to Carlisle and Palms soils and are commonly adjacent to Alden soils. Carlisle soils have organic material at a depth of more than 50 inches. Palms soils are loamy at a depth of 16 to 51 inches. Alden soils formed entirely in loamy material.

Typical pedon of Adrian muck, in Ramapo, 150 feet northeast of the end of Sterling Forest Lane:

Oa1—0 to 6 inches; black (10YR 2/1) muck; less than 5 percent fiber; massive; very friable; few very fine roots; slightly acid; abrupt smooth boundary.

Oa2—6 to 14 inches; dark reddish brown (5YR 2.5/1) muck; less than 10 percent fiber, less than 5 percent rubbed; massive; friable; common fine roots; slightly acid; clear smooth boundary.

Oa3—14 to 26 inches; dark reddish brown (5YR 2.5/2) muck; less than 5 percent fiber, less than 2 percent rubbed; massive; friable; common fine roots; neutral; abrupt smooth boundary.

2C—26 to 60 inches; grayish brown (10YR 5/2) loamy coarse sand; massive; friable; neutral.

The thickness of the organic material and the depth to the substratum range from 16 to 50 inches. The mineral content of the organic layers ranges from 10 to 40 percent. Reaction in the organic layers ranges from strongly acid to mildly alkaline. In the substratum it ranges from moderately acid to moderately alkaline. The C horizon is 0 to 35 percent gravel.

The organic layers have hue of 5YR to 10YR, value of 2 or 3, and chroma of 0 to 3. They are dominantly sapric material, but some pedons have layers of hemic material as much as 4 inches thick.

The substratum is loamy coarse sand or sand or their gravelly analogs. It has hue of 10YR to 5Y, value of 2 to 6, and chroma of 1 to 3.

Alden Series

The Alden series consists of very deep, very poorly drained soils in depressional areas of till plains and bedrock-controlled uplands. The soils formed in glacial till and an 18- to 40-inch-thick layer of material washed from adjacent areas. Slopes are less than 1 percent.

Alden soils are similar to Sloan soils and are on the landscape with Haven, Fredon, and Watchaug soils. Sloan soils are on flood plains. Fredon, Haven, and Watchaug soils have a coarse-loamy particle-size control section and are better drained.

Typical pedon of Alden silt loam, in the town of Clarkstown, 1,400 feet south and 800 feet west of the intersection of Route 304 and Route 9W:

A—0 to 9 inches; black (10YR 2/1) silt loam; moderate medium granular structure; very friable, sticky and plastic; many very fine and common fine roots; slightly acid; clear smooth boundary.

Bg1—9 to 14 inches; dark gray (10YR 4/1) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable, sticky and plastic; common fine and few medium roots; slightly acid; gradual smooth boundary.

Bg2—14 to 33 inches; dark gray (10YR 4/1) silt loam; common fine and medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable, sticky and plastic; few fine and very fine roots; slightly acid; diffuse smooth boundary.

2Cg—33 to 60 inches; brown (10YR 5/3) loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable, slightly sticky and plastic; slightly acid.

The thickness of the solum is 20 to 36 inches. The content of rock fragments ranges from 0 to 15 percent in the A and B horizons and up to 35 percent in the C horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 0 to 2. The horizon is fine sandy loam or silt loam. Reaction is strongly acid to neutral.

The Bg horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 0 to 2. Mottles are common or many and distinct or prominent. The horizon is silty clay loam, silt loam, or very fine sandy loam. Reaction is moderately acid to neutral.

The 2Cg horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 0 to 3. The horizon ranges from fine sandy loam to silty clay loam or their gravelly analogs. Reaction is slightly acid to moderately alkaline.

Carlisle Series

The Carlisle series consists of very deep, very poorly drained soils formed in well decomposed organic material. They are in depressional areas of swamps and bogs that are ponded for much of the year. Slopes range from 0 to 2 percent.

Carlisle soils and Adrian and Palms soils formed in the same kind of material, and Carlisle soils are near Alden and Palms soils. Adrian and Palms soils formed in organic material less than 50 inches thick. Alden soils formed entirely in loamy material.

Typical pedon of Carlisle muck, in the town of Clarkstown, 600 feet east of Sickletown Road and 420 feet south of Green Road, 100 feet west of a tributary of the Hackensack River:

Oa1—0 to 11 inches; black (N 2/0) muck; 2 percent fiber rubbed; weak medium granular structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

Oa2—11 to 27 inches; black (10YR 2/1) muck; 15 percent fiber rubbed; weak medium and coarse subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

Oa3—27 to 51 inches; black (5YR 2/1) muck; 5 percent fiber rubbed; massive; friable; slightly acid; gradual smooth boundary.

Oa4—51 to 80 inches; black (10YR 2/1) muck; 5 percent fiber rubbed; massive; friable; slightly acid.

The thickness of the organic material is more than 50 inches, and in many areas it is 10 to 15 feet. The amount of undecomposed plant remains, some of which are woody, is variable. Reaction ranges from strongly acid to neutral and commonly is less acid with depth.

The surface tier has hue of 10YR, value of 2, and chroma of 1, or it is neutral. The subsurface and bottom tiers have hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 to 3.

Charlton Series

The Charlton series consists of very deep, well drained soils that formed in glacial till. They are on the tops and sides of hills and ridges on uplands. Slopes range from 2 to 50 percent.

Charlton soils are similar to Chatfield, Cheshire, Paxton, Wethersfield, Riverhead, and Yalesville soils. Chatfield and Yalesville soils are moderately deep to bedrock. Cheshire soils have hue of 5YR or redder in the B horizon. Paxton and Wethersfield soils have a dense, very slowly permeable substratum. Riverhead soils have stratified sand and gravel in the substratum and at a depth of less than 40 inches.

Typical pedon of Charlton fine sandy loam, 2 to 15 percent slopes, very stony, in Harriman State Park, ⅛ mile east of Seven Lakes Parkway, on the north side of a service road at the north end of Lake Sebago:

A—0 to 5 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; 10 percent gravel, 3 percent cobbles; moderately acid; clear smooth boundary.

Bw1—5 to 25 inches; brown (7.5YR 4/4) gravelly loam; weak medium and coarse subangular blocky structure; many fine and few medium roots; 20 percent gravel, 5 percent cobbles; very few thin silt coats on faces of peds; moderately acid; gradual smooth boundary.

Bw2—25 to 38 inches; yellowish brown (10YR 5/6) gravelly loam; weak medium and coarse subangular blocky structure; friable; common fine and medium roots; common fine pores; 25 percent gravel, 5 percent cobbles; few thin silt coatings on faces of peds; strongly acid; clear smooth boundary.

2C—38 to 60 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak thick platy structure; firm; common fine pores; 30 percent gravel, 10 percent cobbles; strongly acid.

The solum thickness ranges from 20 to 38 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 5 to 35 percent to a depth of 40 inches and is as much as 50 percent below 40 inches. Reaction throughout the soil is very strongly acid to moderately acid.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. It is commonly fine sandy loam or loam and their gravelly analogs.

The upper part of the B horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. The lower part of the B horizon has hue of 10YR or 2.5Y and value and chroma of 4 to 6. The B horizon is fine sandy loam, sandy loam, or loam or their gravelly analogs.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The main texture in the fine-earth fraction is fine sandy loam, sandy loam, or loam. Commonly, pockets or thin lenses of loamy sand or sand are in the C horizon of some pedons.

Chatfield Series

The Chatfield series consists of moderately deep, well drained and somewhat excessively drained soils formed in glacial till derived mainly from granite, gneiss, and schist. They are on bedrock-controlled hills and ridges on uplands. Slopes range from 5 to 25 percent.

Chatfield soils are in the same family as Cheshire, Paxton, Riverhead, Wethersfield, and Yalesville soils and are similar to Hollis and Holyoke soils. Cheshire, Paxton, Riverhead, and Wethersfield soils are very deep to bedrock. Yalesville soils have hue of 10R to 5YR in the B horizon. Hollis soils have bedrock at a depth of less than 20 inches.

Typical pedon of Chatfield gravelly sandy loam, in an area of Chatfield-Rock outcrop complex, hilly, in the town of Haverstraw, east of Calls Hollow Road, 1,100 feet east and 200 feet south of the town water tank:

A—0 to 9 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; 20 percent gravel, 5 percent cobbles; very strongly acid; clear smooth boundary.

Bw1—9 to 18 inches; dark yellowish brown (10YR 4/6) gravelly sandy loam; moderate fine and medium angular blocky structure; very friable, slightly sticky and slightly plastic; many very fine and common medium roots; many very fine and fine pores; few thin clay films on faces of peds; 15 percent gravel; strongly acid; gradual smooth boundary.

Bw2—18 to 25 inches; dark yellowish brown (10YR 4/6) loam; moderate medium subangular blocky structure; friable, slightly sticky and plastic; common very fine and fine roots; common very fine and fine pores; 10 percent gravel; strongly acid; abrupt smooth boundary.

R—25 inches; hard granite bedrock.

The solum thickness ranges from 16 to 36 inches. The depth to bedrock ranges from 20 to 40 inches. The content of rock fragments ranges from 5 to 50 percent in the surface layer and 5 to 35 percent in the subsoil and substratum. Reaction throughout ranges from very strongly acid to moderately acid.

Some pedons have an O horizon 1 to 3 inches thick that is composed of moss and slightly decomposed plant remnants.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4. The texture is gravelly sandy loam or gravelly loam. Structure is weak or moderate fine or medium granular. Consistence is friable or very friable.

The Bw horizon has hue of 7.5YR to 2.5Y and value and chroma of 4 to 6. The horizon is fine sandy loam, sandy loam, or loam or their gravelly analogs. Consistence is friable or very friable.

Some pedons have a C horizon. It has hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 2 to 4. The horizon is fine sandy loam, sandy loam, or loam or their gravelly analogs.

Cheshire Series

The Cheshire series consists of very deep, well drained soils that formed in glacial till derived mainly from red Triassic sandstone. Cheshire soils are on the sides and tops of glaciated hills. Slopes range from 2 to 15 percent.

Cheshire soils are in the same family as Charlton, Chatfield, Paxton, and Riverhead soils and are similar to Holyoke, Watchaug, Wethersfield, and Yalesville soils. Holyoke soils are shallow to bedrock, and Chatfield and Yalesville soils are moderately deep. Paxton and Wethersfield soils have a dense, slowly permeable or very slowly permeable substratum. Charlton soils have yellower hue than Cheshire soils. Riverhead soils formed in glacial outwash. Watchaug soils are moderately well drained.

Typical pedon of Cheshire gravelly fine sandy loam, 2 to 8 percent slopes, in the town of Ramapo, 200 feet north of Viola Road and ½ mile west of Route 306:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) gravelly fine sandy loam; weak medium and fine granular structure; friable; many roots; 15 percent gravel and 5 percent cobbles; strongly acid; abrupt smooth boundary.

Bw—10 to 22 inches; reddish brown (5YR 4/4) gravelly fine sandy loam; weak fine and medium subangular blocky structure; friable; common roots; common fine pores; 15 percent gravel and 5 percent cobbles; moderately acid; clear wavy boundary.

C—22 to 60 inches; dark reddish brown (2.5YR 3/4) gravelly sandy loam; weak thick platy structure; firm; few roots; 15 percent gravel and 10 percent cobbles; common fine pores; strongly acid.

The thickness of the solum ranges from 20 to 30 inches. The depth to red sandstone bedrock is more than 6 feet. The rock fragment content ranges from 15 to 35 percent in the A horizon and from 10 to 35 percent in the B and C horizons. Some subhorizons are 5 to 10 percent cobblestones. In unlimed areas, reaction throughout the soil is very strongly acid to moderately acid.

The A horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. The horizon is sandy loam to silt loam or their gravelly analogs.

The Bw horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 4 to 6. It is sandy loam to silt loam or their gravelly analogs.

The C horizon has hue of 2.5YR or 5YR and value and chroma of 3 or 4. It is sandy loam to loam or their gravelly analogs.

Fluvaquents

Fluvaquents consist of somewhat poorly drained to very poorly drained soils formed in recent alluvial deposits on flood plains. The soils have little or no profile development. Slopes range from 0 to 2 percent.

Fluvaquents are in an intricate pattern with Medisaprists and commonly are near Ipswich and Sloan soils. Ipswich soils formed in organic deposits and are in shallow marshes farther from the stream channel. Sloan soils are very poorly drained and are in depressional areas on the flood plain. Medisaprists are very poorly drained and are in marshes.

Because Fluvaquents are so variable, a typical pedon is not provided. The thickness of the solum ranges from 1 to 12 inches. The depth to bedrock is more than 5 feet. Reaction ranges from very strongly acid to mildly alkaline. The content of coarse fragments ranges from 0 to 60 percent, by volume.

The A horizon has hue of 7.5YR to 5Y, value of 2 to 4, and chroma of 0 to 2. It ranges from fine sand to silty clay loam in the fine-earth fraction.

The C horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 0 to 2. It is sandy loam to silty clay loam in the fine-earth fraction.

Fredon Series

The Fredon series consists of very deep, somewhat poorly drained and poorly drained soils on terraces. The soils formed in gravelly glacial outwash and stream-terrace deposits. Slopes range from 0 to 3 percent.

Fredon soils are similar to Haven, Rippowam, and Watchaug soils. Haven soils are well drained. Rippowam and Watchaug soils do not have contrasting layers in the control section.

Typical pedon of Fredon loam, in a wooded area 1,200 feet east of Camp Hill Road and 1,000 feet south of Route 202, in the Town of Ramapo:

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; 10 percent gravel; moderately acid; abrupt smooth boundary.

Eg—10 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam; weak fine granular structure; friable; common fine roots; 10 percent gravel; slightly acid; abrupt wavy boundary.

Bw—15 to 25 inches; brown (7.5YR 5/4) gravelly fine sandy loam; many medium and coarse distinct yellowish brown (10YR 5/4) and brownish yellow (10YR 6/6) mottles; very weak medium and coarse subangular blocky structure; very friable; few roots; grayish brown (10YR 5/2) ped faces; 20 percent gravel; slightly acid; abrupt smooth boundary.

2C—25 to 60 inches; brown (7.5YR 5/4) very gravelly loamy sand; single grain; loose; 50 percent gravel; slightly acid, becoming neutral with depth.

The depth to bedrock is more than 5 feet. The depth to the contrasting layer of sand and gravel ranges from 22 to 35 inches. The rock fragment volume is 2 to 15 percent in the surface layer, 2 to 35 percent in the subsoil, and 10 to 60 percent in the substratum. The solum is moderately acid to neutral, and the substratum is moderately acid to moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 1 or 2. It is loam, fine sandy loam, very fine sandy loam, or silt loam.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 2 to 4. It is fine sandy loam to silt loam or their gravelly analogs.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. The horizon is sand to loamy fine sand or their gravelly or very gravelly analogs.

Haven Series

The Haven series consists of very deep, well drained soils on stream terraces and valley trains. The soils formed in loamy, water-deposited material over stratified gravel and sand. Slopes range from 0 to 8 percent.

Haven soils are similar to Fredon and Hinckley soils and are near Watchaug soils. Hinckley soils are more sandy in the upper part of the solum. Fredon, Alden, and Watchaug soils are wetter and more mottled.

Typical pedon of Haven loam, 3 to 8 percent slopes, 1,000 feet north of Filors Lane and 500 feet east of Route 9W, in the town of Stony Point:

Ap—0 to 5 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; 5 percent gravel; neutral; abrupt smooth boundary.

Bw1—5 to 14 inches; yellowish brown (10YR 5/4) loam;

weak fine and medium subangular blocky structure; friable; common roots; 2 percent gravel; very strongly acid; clear smooth boundary.

Bw2—14 to 28 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few roots; 2 percent gravel; very strongly acid; abrupt wavy boundary.

2C—28 to 60 inches; dark brown to brown (7.5YR 5/4 and 10YR 4/3) very gravelly sand; single grain; loose; 50 percent gravel; strongly acid.

The thickness of the solum and the depth to the contrasting coarse material are 20 to 30 inches. The rock fragment content is 2 to 15 percent in the solum and 10 to 60 percent in the substratum. The reaction throughout unlimed areas is very strongly acid to moderately acid.

The Ap or A horizon has hue of 10YR and value and chroma of 3 or 4. It is loam, silt loam, or fine sandy loam.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, very fine sandy loam, or silt loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. The horizon is sand to loamy sand or their gravelly or very gravelly analogs.

Hinckley Series

The Hinckley series consists of very deep, excessively drained soils formed in water-deposited sand and gravel. The soils are on the tops and sides of stream terraces. Slopes range from 0 to 25 percent.

Hinckley soils are similar to Fredon, Haven, and Riverhead soils. Haven soils are better drained than Fredon soils and coarser textured than Haven or Riverhead soils.

Typical pedon of Hinckley gravelly loamy sand, 3 to 8 percent slopes, in Orangetown, 1,700 feet north of Oak Tree Road and 100 feet west of Route 9W:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly loamy sand; weak fine granular structure; friable; many fine roots; 20 percent gravel; strongly acid; abrupt smooth boundary.

Bw1—4 to 10 inches; strong brown (7.5YR 5/6) gravelly loamy sand; weak fine granular structure; very friable; many fine roots; 25 percent gravel; strongly acid; abrupt smooth boundary.

Bw2—10 to 17 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; weak fine granular structure; very friable; common fine roots; 30 percent gravel; strongly acid; abrupt smooth boundary.

2C—17 to 60 inches; brown (7.5YR 5/4) very gravelly sand; single grain; loose; few fine roots in upper part; 50 percent gravel; moderately acid.

The thickness of the solum ranges from 12 to 24 inches. The depth to bedrock is more than 60 inches. The rock fragment content is 15 to 35 percent in the surface layer, 10 to 45 percent in the subsoil, and 30 to 50 percent in the substratum. The reaction throughout is very strongly acid to moderately acid, and the acidity is lower as the depth increases.

The Ap or A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy coarse sand to sandy loam or their gravelly analogs.

The B horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 or 3. In the fine-earth fraction it is loamy fine sand to coarse sand.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 8. The horizon is loamy fine sand to coarse sand or their gravelly or very gravelly analogs.

Hollis Series

The Hollis series consists of shallow, somewhat excessively drained and well drained soils formed in glacial till derived from gneiss, schist, and granite. The soils are on side slopes of bedrock-controlled ridges. Slopes range from 35 to 60 percent.

Hollis soils are similar to Holyoke soils and are on the same types of landscapes as Yalesville and Chatfield soils. Holyoke soils have rock fragments of red sandstone, shale, or conglomerate and have a redder hue than Hollis soils. The Yalesville and Chatfield soils are moderately deep to bedrock.

Typical pedon of Hollis fine sandy loam, in an area of Hollis-Rock outcrop complex, very steep, in the town of Stony Point, 100 feet south of the gravel pit south of Mott Farm Road and between Lake Bullowa and Tompkins Lake:

Oi—1 inch to 0; undecomposed leaf litter and twigs.

A—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, pale brown (10YR 6/3) dry; strong fine granular structure; very friable, sticky and slightly plastic; many very fine and fine roots; few coarse and medium roots; many fine and common medium pores; 5 percent gravel; very strongly acid; clear smooth boundary.

Bw—9 to 18 inches; yellowish brown (10YR 5/6) fine sandy loam; moderate medium subangular blocky structure; very friable, slightly sticky and slightly plastic; common fine and medium roots; many fine and common medium tubular pores; 5 percent gravel; very strongly acid; abrupt wavy boundary.

R—18 inches; unweathered bedrock.

The thickness of the solum and the depth to bedrock range from 10 to 20 inches. The bedrock is granite, gneiss, or schist. Reaction in unlimed areas is very strongly acid to moderately acid.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. The horizon in the fine-earth fraction is loam, sandy loam, or fine sandy loam. The content of rock fragments ranges from 5 to 15 percent.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The horizon is loam, sandy loam, or fine sandy loam or their gravelly analogs. The content of rock fragments, mostly pebbles, ranges from 5 to 35 percent.

Some pedons have a C horizon. It has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 5 or 6. It is loam, sandy loam, or fine sandy loam or their gravelly analogs. The content of coarse fragments ranges from 5 to 35 percent.

Holyoke Series

The Holyoke series consists of shallow, well drained soils formed in a thin mantle of glacial till derived mainly from basalt, red sandstone, conglomerate, and shale. The soils are on bedrock-controlled hills and ridges. Slopes range from 3 to 50 percent.

Holyoke soils are similar to Hollis soils and are on the same types of landscapes as Yalesville and Chatfield soils. Holyoke soils have a subsoil that is not as yellow as that in the Hollis soils. The Yalesville and Chatfield soils are moderately deep to bedrock.

Typical pedon of Holyoke silt loam, in an area of Holyoke-Rock outcrop complex, hilly, in Orangetown, 4,500 feet east of Greenbush Road, 50 feet south of Clausland Mountain Road:

Oi—2 inches to 0; very dark grayish brown (10YR 3/2) partly decomposed leaf litter; very strongly acid.

A—0 to 4 inches; dark brown (7.5YR 3/2) silt loam, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; friable; many fine roots; 5 percent gravel; strongly acid; abrupt smooth boundary.

Bw1—4 to 10 inches; strong brown (7.5YR 5/6) silt loam; very weak coarse subangular blocky structure parting to weak medium granular; friable; many fine and few medium roots; few fine pores; 5 percent gravel; very strongly acid; abrupt smooth boundary.

Bw2—10 to 16 inches; reddish brown (5YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; many fine and few medium roots; few fine pores; 10 percent gravel; very strongly acid; abrupt smooth boundary.

R—16 inches; strongly jointed diabase rock.

The thickness of the solum and the depth to bedrock range from 10 to 20 inches. The bedrock is basalt, red sandstone, conglomerate, or shale. Reaction is very strongly acid to moderately acid. The content of rock fragments is 5 to 15 percent in the surface layer and 5 to 35 percent in the subsoil.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 2 or 3. The horizon is silt loam, loam, or very fine sandy loam.

The B horizon has hue of 5YR or 7.5YR and value and chroma of 4 to 6. The horizon mainly is silt loam but in some areas is loam, very fine sandy loam, or fine sandy loam or their gravelly analogs.

Ipswich Series

The Ipswich series consists of very deep, very poorly drained soils formed in moderately decomposed organic material. The soils are in tidal marshes subject to daily inundation by saltwater. Slopes range from 0 to 2 percent.

Ipswich soils and Carlisle and Palms soils formed in the same kind of material, but Carlisle and Palms soils are not subject to daily tidal flooding. Ipswich soils are deeper to mineral material than Palms soils are.

Typical pedon of Ipswich mucky peat, in the town of Stony Point, 2,300 feet east of the intersection of Route 9W and Iona Island Road and 1,200 feet south of the intersection of the Penn Central Railroad line and Iona Island Road:

Oe1—0 to 12 inches; dark olive gray (5Y 3/2) mucky peat; 80 percent herbaceous fiber, 30 percent rubbed; massive; dense mat of roots and stones; slightly sticky; many very fine and fine roots; 30 percent silt; slightly acid; clear smooth boundary.

Oe2—12 to 40 inches; dark olive (5Y 3/3) mucky peat; 60 percent herbaceous fiber, 30 percent rubbed; massive; nonsticky; 20 percent silt; slightly acid; diffuse smooth boundary.

Oe3—40 to 60 inches; black (10YR 2/1) mucky peat; 50 percent herbaceous fiber, 25 percent rubbed; massive; nonsticky; common fine roots; 40 percent silt and very fine sand; slightly acid.

The thickness of the organic material is more than 51 inches. Thin layers of silt to very fine sand are in most pedons. The mineral content throughout ranges from 5 to 80 percent. Reaction is strongly acid to neutral.

The surface tier has hue of 10YR to 5Y, value of 2 to 4, and chroma of 0 to 3. It is mucky peat or muck. The fiber content is 35 to 100 percent unrubbed and 20 to 75 percent rubbed.

The subsurface tier has hue of 10YR to 5Y, value of 2 to 4, and chroma of 0 to 3. It is mucky peat or muck. The fiber content is 20 to 85 percent unrubbed and 10 to 40 percent rubbed.

The bottom tier has hue of 10YR to 5Y, value of 2 to 4, and chroma of 0 to 3. It is mucky peat or muck. The fiber content is 10 to 70 percent unrubbed and less than 40 percent rubbed.

Medisaprists

Medisaprists, commonly called freshwater or tidal marshes, consist of very deep, very poorly drained soils formed in well decomposed organic deposits. They are on flood plains of the Hudson River. They are ponded throughout much of the year and are inundated by the tides of the river. Slopes are 0 to 1 percent.

Medisaprists are in an intricate pattern with Fluvaquents and are near Ipswich and Sloan soils. Ipswich soils formed in organic deposits and are in shallow marsh areas. Sloan soils formed in mineral alluvial sediments.

Because of the variability of Medisaprists, a typical pedon is not provided. The thickness of the organic deposits ranges from 16 inches to more than 50 inches. Bedrock is at a depth of more than 5 feet, and it directly underlies the organic deposits in some pedons. More commonly, mineral material is below the organic sediments. It ranges from silty clay loam to loamy sand. Reaction is very strongly acid to mildly alkaline. The content of coarse fragments in the mineral layers ranges from 0 to 35 percent, by volume.

The organic layers have hue of 7.5YR to 5Y, value of 2 or 3, and chroma of 0 to 2. Fiber content is less than 15 percent rubbed. The organic layers are dominantly muck, but the surface layer includes mucky peat. Thin layers of mineral material that has a texture of silt loam to sandy loam are in some pedons. The underlying mineral material has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2, or it is neutral.

Palms Series

The Palms series consists of very deep, very poorly drained soils formed in well decomposed organic material over loamy material at a depth of 16 to 50 inches. Palms soils are in depressional areas that were lakes or ponds. They receive runoff from surrounding areas. Slopes range from 0 to 2 percent.

Palms soils are on the same types of landscapes as Carlisle and Adrian soils and are near Alden and Fredon soils. Alden and Fredon soils formed in mineral material. Carlisle soils have organic material at a depth of more than 50 inches.

Typical pedon of Palms muck, in Orangetown, 1,000 feet northwest of Kings Highway and 50 feet southwest of the Erie Railroad right-of-way:

Oa1—0 to 15 inches; black (N 2/0) broken face and very dark brown (10YR 2/2) rubbed muck; 30 percent fiber unrubbed, 3 percent rubbed; weak medium subangular blocky structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Oa2—15 to 32 inches; black (N 2/0) broken face and black (10YR 2/1) rubbed muck; 60 percent fiber unrubbed, 10 percent rubbed; weak medium subangular blocky structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

2C—32 to 36 inches; dark grayish brown (10YR 4/2) very fine sandy loam; massive; friable; common fine roots; 5 percent fine gravel; neutral; abrupt smooth boundary.

3C1—36 to 55 inches; yellowish red (5YR 4/6) silt loam; massive; friable; few fine roots; neutral; gradual smooth boundary.

3C2—55 to 62 inches; reddish brown (5YR 4/4) silty clay loam; massive; firm; plastic; neutral.

The depth to the loamy material ranges from 16 to 50 inches. The organic layers consist almost entirely of decomposed herbaceous material. Reaction in the organic layers ranges from strongly acid to slightly acid, and the acidity decreases as the depth increases. The substratum is slightly acid or neutral.

The organic layers have hue of 5YR to 10YR, value of 2 or 3, and chroma of 0 to 3, or they are neutral. Thin hemic layers are in some pedons.

The substratum has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is sandy loam to light silty clay loam. The rock fragment content ranges from 0 to 15 percent.

Paxton Series

The Paxton series consists of very deep, well drained soils formed in compact glacial till derived mainly from granite, schist, and gneiss. They are on the sides and tops of hills on uplands. Slopes range from 2 to 35 percent.

Paxton soils are in the same family as Charlton, Chatfield, Cheshire, Riverhead, Wethersfield, and Yalesville soils and are similar to Watchaug soils. Charlton and Cheshire soils do not have a dense substratum. Chatfield and Yalesville soils are 20 to 40 inches deep to bedrock. Cheshire and Wethersfield soils have hue of 5YR or redder in the B horizon. Riverhead soils have a stratified C horizon within a depth of 40 inches. Watchaug soils have 2-chroma mottles within a depth of 24 inches.

Typical pedon of Paxton gravelly fine sandy loam, in an area of Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony, in the town of Haverstraw, east of Calls Hollow Road, in a road cut 1,000 feet northeast of the town water tank:

A—0 to 3 inches; brown (10YR 4/3) gravelly fine sandy loam; moderate fine granular structure; very friable; many very fine and fine roots and common medium roots; many fine and common medium pores; 20 percent rock fragments; very strongly acid; abrupt smooth boundary.

Bw1—3 to 13 inches; yellowish brown (10YR 5/6) gravelly loam; weak fine subangular blocky structure; very friable; many common and medium roots; common medium pores; 20 percent rock fragments; strongly acid; clear smooth boundary.

Bw2—13 to 25 inches; yellowish brown (10YR 5/6) gravelly loam; weak fine subangular blocky structure; very friable; common fine and medium roots; many fine pores; 20 percent rock fragments; strongly acid; abrupt smooth boundary.

BC—25 to 29 inches; brown (10YR 4/3) gravelly fine sandy loam; weak fine subangular blocky structure; firm; few very fine roots; many fine and medium vesicular pores; 20 percent rock fragments; strongly acid; clear smooth boundary.

Cd—29 to 60 inches; grayish brown (2.5Y 5/2) gravelly fine sandy loam; weak medium platy structure; very firm; common fine vesicular pores; 30 percent rock fragments; strongly acid.

The solum thickness ranges from 20 to 36 inches and commonly corresponds to the depth to the substratum. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 35 percent in the surface layer, from 5 to 35 percent in the subsoil, and from 10 to 40 percent in the substratum. Reaction throughout the soil ranges from very strongly acid to moderately acid.

The A horizon has value of 3 or 4 and chroma of 2 to 4. Texture ranges from loam to sandy loam but is dominantly fine sandy loam or its gravelly analog.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is sandy loam, fine sandy loam, or loam or their gravelly analogs.

The Cd horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 2 to 4. The horizon is sandy loam, fine sandy loam, or loam or their gravelly or very gravelly analogs.

Rippowam Series

The Rippowam series consists of very deep, poorly drained soils on flood plains. The soils formed in alluvium mainly from granite and sandstone. Slopes range from 0 to 3 percent.

Rippowam soils are similar to Fredon soils and are adjacent to Sloan soils. Fredon soils do not have an irregular decrease in the content of organic matter as the depth increases. Sloan soils have a fine-loamy particle-size control section.

Typical pedon of Rippowam sandy loam, 5,940 feet north of Route 202 and 130 feet west of the Palisades Parkway, in the Town of Haverstraw:

A—0 to 10 inches; very dark grayish brown (10YR 3/2) sandy loam; weak medium granular structure; very friable; many very fine and fine roots and common medium roots; many very fine and fine and few medium pores; strongly acid; clear smooth boundary.

Bw1—10 to 19 inches; dark grayish brown (10YR 4/2) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable, slightly sticky, nonplastic; common very fine and few fine roots; many very fine and common fine pores; strongly acid; clear smooth boundary.

Bw2—19 to 28 inches; grayish brown (10YR 5/2) sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very friable; common fine roots; common fine pores; moderately acid; gradual smooth boundary.

BC—28 to 35 inches; very dark gray (10YR 3/1) and grayish brown (10YR 5/2) fine sandy loam; few faint brown (7.5YR 5/4) mottles; massive; very friable; common fine roots; common fine pores; moderately acid; gradual smooth boundary.

2C—35 to 60 inches; dark brown (10YR 4/3) loamy sand; single grain; loose; moderately acid.

The solum thickness ranges from 20 to 40 inches. The depth to bedrock is more than 5 feet. The rock fragment content is 0 to 15 percent in the solum and 0 to 40 percent in the substratum. Reaction ranges from very strongly acid to slightly acid.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is fine sandy loam or sandy loam.

The B horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 to 3, and it is mottled. It is sandy loam or fine sandy loam.

The C horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 to 3. The horizon ranges mainly from loamy fine sand to coarse sand but in some areas has thin strata of sandy loam or silt loam or their gravelly analogs.

Riverhead Series

The Riverhead series consists of very deep, well drained soils. The soils formed in glacial outwash derived dominantly from granitic rocks. The soils are on outwash plains and terraces. Slopes range from 0 to 25 percent.

Riverhead soils are in the same family as Charlton, Chatfield, Cheshire, Paxton, Wethersfield, and Yalesville soils and are on the same types of landscapes as Hinckley and Fredon soils. Chatfield and Yalesville soils are moderately deep to bedrock. Paxton and Wethersfield soils have a dense substratum. Charlton and Cheshire soils do not have stratified sand and gravel in the C horizon, and they formed in deep glacial till. Hinckley soils have a sandy-skeletal particle-size control section. Fredon soils have low-chroma mottles within a depth of 24 inches.

Typical pedon of Riverhead fine sandy loam, 3 to 8 percent slopes, in the town of Ramapo, 2,500 feet north of Pomona Road and 1,200 feet east of Camp Hill Road:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; many fine and medium roots; less than 5 percent rock fragments (fine gravel); strongly acid; abrupt smooth boundary.

Bw1—9 to 16 inches; strong brown (7.5YR 5/6) fine sandy loam; weak fine and medium subangular blocky structure parting to weak fine granular; friable; common fine and medium roots; 5 percent fine gravel; strongly acid; clear wavy boundary.

Bw2—16 to 24 inches; brown to dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure parting to weak medium granular; friable; few roots; 5 percent rock fragments (fine gravel); strongly acid; abrupt smooth boundary.

2BC—24 to 30 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine and medium granular structure; very friable; 2 percent rock fragments; strongly acid; abrupt smooth boundary.

3C—30 to 60 inches; yellowish brown (10YR 5/4) and light brown (7.5YR 6/4) very gravelly sand; single grain; loose; 50 percent gravel; strongly acid, becoming medium acid with increasing depth.

The thickness of the solum and the depth to sand and gravel range from 20 to 40 inches. The depth to bedrock is more than 60 inches. The rock fragment content ranges from 0 to 15 percent in the surface layer, 5 to to 35 percent in the subsoil, and 5 to 50 percent in the substratum. The reaction is very strongly acid to medium acid in the solum and very strongly acid to slightly acid in the substratum.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is sandy loam, fine sandy loam, or loam.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. It is fine sandy loam or sandy loam.

The 2BC horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 6. It is loamy fine sand or loamy sand or their gravelly analogs.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 to 6. It is coarse sand, sand, or loamy sand or their gravelly or very gravelly analogs.

Sloan Series

The Sloan series consists of very deep, very poorly drained soils on flood plains. The soils formed in alluvium. Slopes are less than 1 percent.

Sloan soils are near Carlisle, Palms, and Rippowam soils. Palms and Carlisle soils formed in more than 16 inches of organic material. Rippowam soils are coarser textured than Sloan soils.

Typical pedon of Sloan silt loam, 2,400 feet east of Route 303 and 1,700 feet north of Kings Highway, in the town of Orangetown:

A1—0 to 8 inches; very dark gray (N 3/0) silt loam, gray (10YR 5/1) dry; moderate medium and coarse granular structure; friable; many fine roots; medium acid; abrupt wavy boundary.

A2—8 to 22 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; friable; common to few fine roots; slightly acid; clear wavy boundary.

Bg—22 to 45 inches; dark gray (10YR 4/1) silt loam; many medium distinct brown (10YR 5/3) mottles; massive; friable; slightly acid; abrupt smooth boundary.

2C—45 to 60 inches; very dark grayish brown (10YR 3/2) very fine sandy loam; massive; very friable; slightly acid.

The solum thickness ranges from 30 to 50 inches. The depth to bedrock is more than 5 feet. The rock fragment content is 0 to 5 percent in the solum and 0 to 20 percent in the substratum. Reaction in the upper part of the solum is moderately acid to moderately alkaline. In the lower part it is slightly acid to moderately alkaline. Thin lenses of fine sand, medium sand, or fine gravel are in some pedons.

The A horizon has hue of 10YR or is neutral, has value of 2 or 3, and has chroma of 0 or 1. It is mostly silt loam, but the range includes silty clay loam and loam.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2, and it is mottled with higher chroma. It is mostly silty clay loam or silt loam, but the range includes clay loam and loam.

The C horizon has hue of 10YR or 2.5Y. It is very fine sandy loam, silt loam, silty clay loam, or fine sandy loam.

Udorthents

Udorthents consist of somewhat excessively drained to moderately well drained soils mainly in disturbed areas of urban development. Many areas overlie somewhat poorly drained to very poorly drained soils, resulting in a wet substratum. Slopes are commonly less than 8 percent but range to 25 percent.

Because of the variability of Udorthents, a typical pedon is not described. The soils generally are stratified with different types of fill material. Most of the fill material is more than 20 inches thick over the original surface. The fill ranges from silt loam to sand. The rock fragment content ranges from 0 to 60 percent. The color of the soil is variable and generally is not an indicator of wetness.

Some areas of Udorthents are mineral soils placed on organic soils. This commonly occurs in filled, developed areas along the Hudson River.

Udorthents, refuse substratum, are in areas of sanitary landfills. They consist of 20 to 40 inches of soil over layers of refuse. These soils normally have the same texture and color as other Udorthents.

Wallington Series

The Wallington series consists of very deep, somewhat poorly drained soils formed in silty lacustrine deposits. They are on beds of old lake plains adjacent to perennial streams. Slopes range from 0 to 2 percent.

Wallington soils are near Rippowam soils. Rippowam soils are on the flood plain and do not have a fragipan.

Typical pedon of Wallington silt loam, in the town of Orangetown, 1,000 feet west of Blaisdale Road and 1,000 feet south of Orangeburg Road:

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2 dry); weak fine and medium granular structure; friable; many fine and medium roots; neutral (limed); abrupt smooth boundary.

E—4 to 10 inches; gray (10YR 5/1) silt loam; weak fine and medium granular structure; friable; common medium roots; neutral (limed); clear wavy boundary.

Bw—10 to 14 inches; reddish gray (5YR 5/2) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine granular structure; very friable; common medium and fine roots; slightly acid; abrupt smooth boundary.

Bx1—14 to 18 inches; reddish brown (5YR 4/4) silt loam, many medium distinct brown (10YR 5/3) and pale brown (10YR 6/3) mottles; weak very coarse prismatic structure parting to weak thin platy; firm and weakly brittle; weak red (2.5YR 5/2) prism coatings; slightly acid; clear smooth boundary.

Bx2—18 to 40 inches; reddish brown (5YR 4/4) silt loam; few medium distinct brown (10YR 5/3 and 7.5YR 5/2) mottles; moderate coarse prismatic structure parting to weak medium and thick platy; very firm and brittle; weak red (2.5YR 5/2) prism coatings in the upper 4 inches; slightly acid; abrupt smooth boundary.

C—40 to 60 inches; dark brown to brown (7.5YR 4/4 and 4/2) varved silt loam and fine sandy loam; massive; friable; slightly acid.

The solum thickness ranges from 36 to 50 inches. Bedrock is at a depth of more than 60 inches. The depth to the fragipan ranges from 12 to 20 inches. There commonly are no rock fragments, but their content in some pedons is as much as 3 percent in the solum and 5 percent in the substratum. The solum is silt loam or very fine sandy loam.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. Reaction ranges from very strongly acid to medium acid. The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 3.

The Bw horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 or 4. It is very friable or friable. Reaction is very strongly to slightly acid.

The Bx horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is firm or very firm. Reaction is very strongly acid to neutral.

The C horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. The texture ranges from loamy very fine sand to silt loam. Reaction is medium acid to neutral.

Watchaug Series

The Watchaug series consists of very deep, moderately well drained soils. The soils formed in glacial till derived dominantly from red Triassic sandstone. They are in slightly depressed areas on foot slopes of glaciated uplands. Slopes range from 0 to 3 percent.

Watchaug soils are near Holyoke, Yalesville, Cheshire, Wethersfield, and Alden soils. Watchaug soils are deeper to bedrock than Holyoke or Yalesville soils. They have mottles in the lower part of the B horizon, and Cheshire and Wethersfield soils do not. Alden soils are in drainageways and are very poorly drained.

Typical pedon of Watchaug fine sandy loam, in a wooded area 50 feet west of Route 303 and ½ mile south of the junction of Route 9W and Route 303, in the town of Clarkstown.

Oe—2 inches to 0; black (N 2/0) decomposed leaf litter; weak medium granular structure; very friable; very strongly acid; abrupt smooth boundary.

A—0 to 5 inches; dark reddish brown (5YR 3/2) fine sandy loam, pinkish gray (5YR 6/2) dry; weak fine granular structure; friable; many roots; 10 percent rock fragments; strongly acid; abrupt smooth boundary.

Bw1—5 to 15 inches; reddish brown (5YR 4/3) gravelly fine sandy loam; weak medium and coarse subangular blocky structure; friable; many roots; 15 percent rock fragments; strongly acid; abrupt smooth boundary.

Bw2—15 to 21 inches; reddish brown (5YR 4/3) gravelly fine sandy loam; common medium distinct reddish gray (5YR 5/2) and yellowish red (5YR 4/6) mottles; weak coarse subangular blocky structure; friable; few roots; 20 percent rock fragments; medium acid; clear smooth boundary.

C—21 to 62 inches; reddish brown (5YR 4/3) gravelly fine sandy loam; massive; friable; 20 percent rock fragments; slightly acid; abrupt smooth boundary.

R—62 inches; weak red (2.5YR 4/2) Triassic conglomerate.

The thickness of the solum ranges from 20 to 30 inches. The depth to bedrock is more than 60 inches. The depth to mottling is 15 to 24 inches. Most undisturbed areas have a layer 1 to 2 inches thick of partially decomposed or well decomposed leaf litter. The content of rock fragments ranges from 5 to 15 percent in the surface layer and subsoil and from 5 to 35 percent in the substratum. Reaction in the surface layer and subsoil is very strongly to moderately acid. Reaction in the substratum ranges from very strongly acid to slightly acid.

The A horizon has hue of 5YR to 10YR and value and chroma of 2 or 3. It ranges from sandy loam to silt loam or their gravelly analogs.

The B horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 6. It is mottled at a depth of less than 24 inches. It is dominantly fine sandy loam but ranges from sandy loam to silt loam. Structure is subangular blocky, or the material is massive.

The C horizon has hue of 5YR or 2.5YR and value and chroma of 3 to 6. The horizon ranges from fine sandy loam to sandy loam or their gravelly analogs. Structure is platy, or the material is massive. The consistence is firm or friable.

Wethersfield Series

The Wethersfield series consists of very deep, well drained soils formed in reddish glacial till derived mainly from Triassic sandstone, shale, and conglomerate. The soils are on smooth ridges on uplands. Slopes range from 0 to 25 percent.

Wethersfield soils are similar to Charlton, Paxton, Chatfield, Cheshire, Riverhead, and Yalesville soils. Except for Paxton soils, none of those similar soils has a dense till substratum. Chatfield and Yalesville soils have bedrock at a depth of 20 to 40 inches. Riverhead soils formed in glacial outwash and have stratified sand and gravel in the substratum. Paxton soils have a yellower hue in the subsoil.

Typical pedon of Wethersfield gravelly silt loam, 0 to 3 percent slopes, in the town of Clarkstown, 300 feet west and 200 feet south of the western end of Park Avenue:

Ap—0 to 13 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; friable; many very fine and fine roots; many very fine and medium tubular pores; 15 percent rock fragments; neutral; abrupt smooth boundary.

Bw—13 to 22 inches; reddish brown (5YR 4/4) gravelly loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common very fine and fine pores; 15 percent rock fragments; few very thin clay films in pores; slightly acid; clear wavy boundary.

Cd—22 to 60 inches; reddish brown (5YR 4/4) gravelly fine sandy loam; few faint yellowish red (5YR 4/6) mottles; massive; firm; few very fine and fine roots; many very fine and fine tubular pores; 15 percent rock fragments, 5 percent cobbles; moderately acid.

The solum thickness ranges from 20 to 38 inches. The depth to bedrock is more than 60 inches. The content of rock fragments ranges from 15 to 25 percent in the surface layer, from 5 to 25 percent in the subsoil, and from 5 to 35 percent in the substratum.

The Ap horizon has value of 5YR to 10YR, value of 2 or 3, and chroma of 2 or 3. It is silt loam, loam, or fine sandy loam or their gravelly analogs.

The B horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam, loam, or fine sandy loam or their gravelly analogs. Few thin clay films are in some pedons.

The Cd horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. The horizon mainly is gravelly fine sandy loam but includes silt loam or loam or their gravelly analogs.

Yalesville Series

The Yalesville series consists of moderately deep, well drained soils formed in glacial till derived mainly from red Triassic sandstone. Yalesville soils are on uplands that have a mantle of glacial till over bedrock. Slopes range from 2 to 25 percent.

Yalesville soils are similar to Charlton, Chatfield, Cheshire, Paxton, Riverhead, and Wethersfield soils. All these soils have bedrock at a depth of more than 40 inches. The Chatfield soils have yellower hue in the subsoil.

Typical pedon of Yalesville sandy loam, 8 to 15 percent slopes, in the town of Clarkstown, 500 feet west of Strawtown Road and 1,100 feet south of Kenbar Road:

Ap1—0 to 4 inches; dark brown (7.5YR 3/2) sandy loam, pinkish gray (7.5YR 6/2) dry; weak fine granular structure; very friable; many roots; 10 percent rock fragments; strongly acid; abrupt smooth boundary.

Ap2—4 to 10 inches; dark reddish brown (5YR 3/3) sandy loam; weak fine subangular blocky structure; very friable; many roots; 10 percent rock fragments; strongly acid; abrupt smooth boundary.

Bw1—10 to 16 inches; reddish brown (2.5YR 4/4) gravelly loam; weak coarse subangular blocky structure; very friable; common roots; 20 percent rock fragments (fine gravel); strongly acid; abrupt smooth boundary.

Bw2—16 to 27 inches; red (10R 4/6) gravelly loam; weak coarse subangular blocky structure; friable; few roots; common fine round pores; 25 percent rock fragments (fine gravel); strongly acid; abrupt smooth boundary.

C—27 to 30 inches; red (10R 4/6) extremely channery loam; massive; friable; 80 percent rock fragments (sandstone); strongly acid; abrupt smooth boundary.

R—30 inches; red (10R 4/6) thinly bedded and fine grained Triassic sandstone.

The solum thickness ranges from 20 to 34 inches. The depth to bedrock ranges from 20 to 40 inches. Reaction throughout is very strongly acid to moderately acid. The content of rock fragments ranges from 2 to 15 percent in the surface layer, from 2 to 35 percent in the subsoil, and from 15 to 80 percent in the substratum.

The A horizon has hue of 5YR to 10YR and value and chroma of 2 or 3. It ranges from silt loam to sandy loam. The B horizon has hue of 10R to 5YR, value of 3 to 5, and chroma of 4 to 6. It ranges from sandy loam to silt loam or their gravelly analogs.

In some pedons thicker than 24 inches there is a thin C horizon. Its color is similar to that of the B horizon. The C horizon is sandy loam to loam or their gravelly or channery or very channery or extremely channery analogs.

The bedrock ranges from fine-grained sandstone and shale to a coarse conglomerate that contains numerous cobbles.

Formation of the Soils

The first part of this section describes the factors of soil formation and relates them to the formation of the soils in the survey area. The second part defines the processes of soil horizon development as they relate to soil formation in Rockland County.

Factors of Soil Formation

Soils are products of weathering and other physical and chemical processes that act on parent material. The properties of a soil at a given point on the earth depend on the following factors: the physical and chemical composition of the parent material; the climate; the plant and animal life; the topography; and the time *(4)*. The relative influence of each of these factors differs from place to place, and each modifies the effect of the others. For example, the impact of climate over a given area is tempered by relief or parent material. In many areas, the influence of a single factor is dominant.

Parent Material

Parent material is the unconsolidated earthy material in which soils form. It influences the physical, chemical, and mineralogical composition of the soils. It also influences the rate at which soil-forming processes take place.

Most of the soils in Rockland County formed in material deposited during glaciation, mainly in glacial till. The less extensive deposits are glacial outwash, alluvium, lacustrine material, and organic material.

Soils formed in glacial till have a wide range of characteristics as a result of the heterogeneous nature of the till and its rock and soil particles. For example, Paxton and Wethersfield soils formed in very deep glacial till and have a dense substratum. Charlton and Cheshire soils, however, formed in very deep, coarser textured till and do not have a dense layer. In some soils, the glacial till is moderately deep or shallow over bedrock. Hollis soils, for instance, are shallow to granite, gneiss, or schist; while Yalesville soils are moderately [illegible] to Triassic sandstone, conglomerate, or shale. Some areas have bedrock, or rock outcrop, at the surface.

As the glacial ice melted, large quantities of meltwater transported and sorted soil and rock debris. This material is called glacial outwash and was redeposited in layers of sand and gravel on outwash plains and terraces. Coarse-textured Hinckley soils formed in this material.

More recently, overflowing streams have deposited alluvial material on the flood plains. This material tends to be variable in texture. It is the parent material of Sloan soils, which formed in medium and moderately fine textured alluvium, and Rippowam soils, which formed in moderately coarse textured material.

Soils formed in organic deposits are mainly in closed depressions on uplands and along the Hudson River. Carlisle and Palms soils are examples of soils formed in well decomposed organic material.

Table 21 shows the relationship between the soils in the county and their parent material, position on the landscape, and drainage. First, the soils are grouped based on the landscape position and the type of parent material in which they formed. Next, soils that formed in similar kinds of parent material are grouped based on their depth to bedrock. The soils are further characterized based on the texture and morphology of the parent material from which they are derived. Finally, the soils are placed into drainage classes. Soils having the same parent material and soil depth and occurring on adjacent landscapes, but that have different drainage classes, form a soil catena. Riverhead and Fredon, for example, are soils that form a catena. Some soils, such as Holyoke, have drainage properties which place them in more than one drainage class, so that the name will appear more than once in the table.

Topography

The shape of the land surface—commonly called the lay of the land—and the slope and the position of the land surface as related to the water table are influences on the formation of the soils. Soils that formed in convex positions, where little or no runoff accumulates, are generally well drained and do not contain gray mottles in the subsoil. Examples in this category are Charlton and Chatfield soils. In level or slightly depressional areas, the water table is usually closer to the surface for extended periods. This results in gray mottling close to the surface and, often, accumulation of sediment at the surface. Some soils are wet because they occupy a position where water accumulates in the soil. Alden soils are an example.

Local differences in soils are largely the result of differences in parent material and topography.

Climate

Climate, mainly through temperature and precipitation, is one of the most influential of the soil-forming factors. It determines to a large degree the kind of weathering processes that occur. It also affects the growth and kind of vegetation and the leaching and translocation of weathered materials.

Rockland County has a humid, temperate climate which tends to promote the development of moderately weathered, leached soils. More detailed and specific data on the climate of the county are in the climate section under "General Nature of the County."

Plant and Animal Life

All living organisms, including plants, animals, bacteria, and fungi, influence soil formation. Vegetation is generally responsible for the amount of organic matter and nutrients in the soil and for the color and structure of the surface layer. Earthworms and burrowing animals help to keep the soil porous and more permeable to air and water. Their waste products cause aggregations of soil particles and improve soil structure. Bacteria and fungi decompose vegetation, which results in the release of nutrients.

This survey area was originally in native forest consisting of northern hardwoods and pines. The loss of nutrients through leaching is slow under hardwoods because they take up large quantities of bases (nutrients) and return much of them to the soil surface each year as leaf litter. Conifers, such as pines, do not use large amounts of nutrients; therefore, leaching is more rapid under conifers than under hardwoods. Because the rooting depth is shallow in many of the upland soils, trees are susceptible to windthrow, which has caused mixing of the soil materials.

Human activity, through clearing trees and cultivating the land, has also influenced changes in soils. It has added nutrients by fertilizing, has mixed some soil horizons by plowing, and has accelerated erosion in many areas.

Time

The degree of profile development not only reflects the age of a soil, but it also reflects the influence of other factors. In geological terms, the deposits in which soils formed in the survey area are young, having been deposited when the last glacier receded about 10,000 to 15,000 years ago. The soils have not all reached the same stage of soil profile development, however, because the other soil-forming factors also influence the rate of soil profile development. The time factor is constant within the county; the difference in the appearance and the depth of the weathering is more a function of the differences in the parent material.

An immature soil is one that has not had enough time to develop distinct horizons. Fluvaquents are an example. They formed in recent alluvium which is being flooded regularly and on which sediment is being deposited. Thus, the time for soil development is continually interrupted and a thin or irregular soil profile exists.

Processes of Soil Formation

This section contains an explanation of soil horizon nomenclature and a description of the processes involved in soil horizon development as they relate to soil formation.

The soil-forming factors cause the formation of different layers, or soil horizons. These soil horizons can be viewed in a vertical cut of soil, known as a soil profile. The soil profile extends from the surface downward into material that is little altered by the soil-forming processes. Most soils contain three major horizons, called A, B, and C horizons.

Several processes cause the formation of soil horizons. The major processes are: the accumulating of organic matter, the leaching of soluble salts and minerals, the translocating of clay minerals, the reducing and transferring of iron, and the forming of dense and compact layers in the subsoil *(8)*.

The accumulation of organic matter takes place as plant residue decomposes. This process darkens the surface layer and helps to form the A1 horizon. It takes a long time to replace this organic matter once it has been lost. The organic matter content of the surface layer of soils in the survey area averages about 4 percent.

For soils to develop a distinct subsoil, some of the lime and other soluble salts must be leached before other soil processes such as translocation of clay minerals can take place. The kinds of salts originally present, the rate and depth of percolation, and the texture of the soil are factors that affect leaching.

Translocation of silicate clay minerals is one of the major processes of soil horizon development in some of the soils. The amount of clay minerals in a soil is inherent in the parent material, but clay content varies from one soil horizon to another. Clay particles are transported (eluviation) downward from the A horizon and redeposited (illuviation) in the B horizon as clay films on ped faces, as linings along pores and root channels, and as coatings on some coarse fragments. In some soils an A2 horizon has formed by considerable eluviation of clay minerals to the B horizon. The Wallington soils are an example of a soil whose clay content, because of translocation, is higher in the B horizon than in the A horizon.

The reduction and transfer of iron compounds occur mainly in the wetter, more poorly drained soils. This process is know as gleying. In poorly drained and very poorly drained soils, such as Alden soils, the grayish subsoil indicates the reduction of iron. In moderately well drained and somewhat poorly drained soils, such as Watchaug soils, yellowish brown and reddish brown mottles indicate the segregation of iron compounds. A bright-colored, unmottled subsoil indicates a well drained soil, such as in Haven soils, where no reduction and transfer of iron have taken place.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Cole, David. 1962. History of Rockland County, New York. 67 pp., illus.

(4) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.

(5) New York State Crop Reporting Service. 1982. New York agricultural statistics. N.Y. State Dep. of Agric. and Mark., 347 pp., illus.

(6) New York Water, Power, and Control Commission. 1967. U.S. Geologic Survey cooperative groundwater report. 267 pp., illus.

(7) Rockland County Planning Board. 1986. Rockland County data book. 1984. Rockland Cty. Plann. Board, 282 pp., illus.

(8) Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Sci. Soc. Am. Proc. 23: 152-156, illus.

(9) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(10) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(11) United States Department of Commerce, Bureau of the Census. 1983. 1980 census of the population: Characteristics of the population. Part 34, New York, vol. 1, chap. D, 584 pp.

Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Conservation tillage. A tillage and planting system in which crop residue covers at least 30 percent of the soil surface after planting. Where soil erosion by wind is the main concern, the system leaves the equivalent of at least 1,000 pounds per acre of flat small-grain residue on the surface during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage. (See Conservation tillage.)

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile.

Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1956-82 at Suffern, New York)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Ave sno
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F	Units	In	In	In		
January-----	35.4	15.2	25.3	62	-7	9	3.25	1.32	4.88	5	
February----	37.7	17.3	27.5	60	-4	11	3.25	1.79	4.54	5	
March-------	47.0	26.5	36.8	76	7	56	3.58	1.82	5.11	6	
April-------	60.0	36.9	48.5	86	21	263	4.35	2.66	5.86	8	
May---------	70.6	46.1	58.4	92	31	570	4.03	1.65	6.03	8	
June--------	78.9	55.3	67.1	96	40	813	4.08	2.35	5.62	7	
July--------	83.6	60.0	71.8	96	47	986	4.14	2.10	5.90	7	
August------	82.5	58.4	70.5	93	44	946	4.13	2.17	5.84	7	
September---	75.3	50.6	63.0	93	33	690	4.62	2.27	6.65	6	
October-----	64.2	38.8	51.5	84	23	360	3.77	1.86	5.42	5	
November----	52.7	31.6	42.2	74	15	119	4.16	1.88	6.10	6	
December----	40.1	21.2	30.7	65	0	28	3.76	1.92	5.35	7	
Yearly:											
Average---	60.7	38.2	49.4	---	---	---	---	---	---	---	
Extreme---	---	---	---	97	-8	---	---	---	---	---	
Total-----	---	---	---	---	---	4,851	47.12	39.39	54.33	77	2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding th maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1956-82 at Suffern, New York)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 10	Apr. 23	May 15
2 years in 10 later than--	Apr. 7	Apr. 20	May 10
5 years in 10 later than--	Apr. 2	Apr. 12	Apr. 28
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 21	Oct. 5	Sept. 26
2 years in 10 earlier than--	Oct. 26	Oct. 11	Oct. 2
5 years in 10 earlier than--	Nov. 6	Oct. 22	Oct. 13

TABLE 3.--GROWING SEASON

(Recorded in the period 1956-82 at Suffern, New York)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	197	172	140
8 years in 10	204	179	149
5 years in 10	218	192	167
2 years in 10	231	205	185
1 year in 10	238	212	194

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Aa	Adrian muck	136	0.1
Ad	Alden silt loam	2,742	2.4
Ca	Carlisle muck	1,101	1.0
CeB	Charlton fine sandy loam, 2 to 8 percent slopes	1,033	0.9
CeC	Charlton fine sandy loam, 8 to 15 percent slopes	621	0.5
CeD	Charlton fine sandy loam, 15 to 25 percent slopes	337	0.3
ChC	Charlton fine sandy loam, 2 to 15 percent slopes, very stony	5,210	4.6
ChE	Charlton fine sandy loam, 15 to 35 percent slopes, very stony	2,447	2.1
ChF	Charlton fine sandy loam, 35 to 50 percent slopes, very stony	90	0.1
CkC	Charlton-Rock outcrop complex, rolling	1,830	1.6
CkD	Charlton-Rock outcrop complex, hilly	3,796	3.3
CmB	Charlton-Urban land complex, 2 to 8 percent slopes	105	0.1
CmD	Charlton-Urban land complex, 15 to 25 percent slopes	131	0.1
CoC	Chatfield-Rock outcrop complex, rolling	5,769	5.1
CoD	Chatfield-Rock outcrop complex, hilly	9,982	8.9
CrB	Cheshire gravelly fine sandy loam, 2 to 8 percent slopes	2,631	2.3
CrC	Cheshire gravelly fine sandy loam, 8 to 15 percent slopes	841	0.7
CuB	Cheshire-Urban land complex, 2 to 8 percent slopes	3,473	3.0
CuC	Cheshire-Urban land complex, 8 to 15 percent slopes	651	0.6
Fh	Fluvaquents and Medisaprists, ponded	398	0.3
Fr	Fredon loam	176	0.2
HaA	Haven loam, 0 to 3 percent slopes	147	0.1
HaB	Haven loam, 3 to 8 percent slopes	338	0.3
HbB	Haven-Urban land complex, 0 to 8 percent slopes	129	0.1
HcA	Hinckley gravelly loamy sand, 0 to 3 percent slopes	646	0.6
HcB	Hinckley gravelly loamy sand, 3 to 8 percent slopes	714	0.6
HcC	Hinckley gravelly loamy sand, 8 to 15 percent slopes	155	0.1
HcD	Hinckley gravelly loamy sand, 15 to 25 percent slopes	207	0.2
HdB	Hinckley-Urban land complex, 0 to 8 percent slopes	698	0.6
HlF	Hollis-Rock outcrop complex, very steep	4,272	3.8
HoC	Holyoke-Rock outcrop complex, rolling	2,096	1.8
HoD	Holyoke-Rock outcrop complex, hilly	2,559	2.2
HoF	Holyoke-Rock outcrop complex, very steep	2,130	1.9
HuC	Holyoke-Urban land-Rock outcrop complex, rolling	377	0.3
Ip	Ipswich mucky peat	757	0.7
Pa	Palms muck	335	0.3
PnB	Paxton gravelly fine sandy loam, 2 to 8 percent slopes	391	0.3
PnC	Paxton gravelly fine sandy loam, 8 to 15 percent slopes	118	0.1
PsC	Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony	1,159	1.0
PsE	Paxton gravelly fine sandy loam, 15 to 35 percent slopes, very stony	1,167	1.0
Pt	Pits, gravel	200	0.2
Pv	Pits, quarry	209	0.2
Ra	Rippowam sandy loam	851	0.7
ReA	Riverhead fine sandy loam, 0 to 3 percent slopes	423	0.4
ReB	Riverhead fine sandy loam, 3 to 8 percent slopes	828	0.7
ReC	Riverhead fine sandy loam, 8 to 15 percent slopes	123	0.1
ReD	Riverhead fine sandy loam, 15 to 25 percent slopes	61	0.1
RuB	Riverhead-Urban land complex, 0 to 8 percent slopes	524	0.5
RuC	Riverhead-Urban land complex, 8 to 15 percent slopes	68	0.1
RuD	Riverhead-Urban land complex, 15 to 25 percent slopes	117	0.1
Sa	Sloan silt loam	577	0.5
Ur	Udorthents, refuse substratum	74	0.1
Us	Udorthents, smoothed	2,275	2.0
Uw	Udorthents, wet substratum	1,142	1.0
Ux	Urban land	2,898	2.5
Wa	Wallington silt loam	264	0.2
Wc	Watchaug fine sandy loam	2,417	2.1
WeA	Wethersfield gravelly silt loam, 0 to 3 percent slopes	178	0.2
WeB	Wethersfield gravelly silt loam, 3 to 8 percent slopes	12,935	11.5
WeC	Wethersfield gravelly silt loam, 8 to 15 percent slopes	5,772	5.1
WeD	Wethersfield gravelly silt loam, 15 to 25 percent slopes	2,661	2.3
WuB	Wethersfield-Urban land complex, 2 to 8 percent slopes	10,053	8.9
WuC	Wethersfield-Urban land complex, 8 to 15 percent slopes	4,015	3.5
WuD	Wethersfield-Urban land complex, 15 to 25 percent slopes	1,039	0.9

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
YaB	Yalesville sandy loam, 2 to 8 percent slopes	790	0.7
YaC	Yalesville sandy loam, 8 to 15 percent slopes	222	0.2
YaD	Yalesville sandy loam, 15 to 25 percent slopes	138	0.1
YuB	Yalesville-Urban land complex, 2 to 8 percent slopes	163	0.1
YuC	Yalesville-Urban land complex, 8 to 15 percent slopes	242	0.2
YuD	Yalesville-Urban land complex, 15 to 25 percent slopes	149	0.1
	Water	617	0.5
	Total	113,920	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
CeB	Charlton fine sandy loam, 2 to 8 percent slopes
CrB	Cheshire gravelly fine sandy loam, 2 to 8 percent slopes
Fr	Fredon loam (where drained)
HaA	Haven loam, 0 to 3 percent slopes
HaB	Haven loam, 3 to 8 percent slopes
PnB	Paxton gravelly fine sandy loam, 2 to 8 percent slopes
ReA	Riverhead fine sandy loam, 0 to 3 percent slopes
ReB	Riverhead fine sandy loam, 3 to 8 percent slopes
Sa	Sloan silt loam (where drained)
Wa	Wallington silt loam (where drained)
Wc	Watchaug fine sandy loam
WeA	Wethersfield gravelly silt loam, 0 to 3 percent slopes
WeB	Wethersfield gravelly silt loam, 3 to 8 percent slopes
YaB	Yalesville sandy loam, 2 to 8 percent slopes

TABLE 6.--SOIL SUITABILITY FOR FLOWERS, VEGETABLES, AND FRUIT

(See text for definitions of the ratings. Absence of an entry indicates that the soil is not suited or that the crop is not commonly grown. See text for examples of flowers, fruits, and vegetables)

Soil name and map symbol	Perennial flowers	Annual flowers and vegetables	Tree fruit and small fruit
Aa Adrian	Poor	Poor	Poor.
Ad Alden	Poor	Poor	Poor.
Ca Carlisle	Very poor	Very poor	Very poor.
CeB Charlton	Good	Good	Good.
CeC, CeD Charlton	Fair	Fair	Fair.
ChC, ChE Charlton	Poor	Poor	Poor.
ChF. Charlton			
CkC, CkD Charlton-Rock outcrop	Poor	Poor	Poor.
CmB Charlton-Urban land	Good	Good	Good.
CmD Charlton-Urban land	Fair	Fair	Fair.
CoC Chatfield-Rock outcrop	Poor	Poor	Very poor.
CoD Chatfield-Rock outcrop	Poor	Very poor	Very poor.
CrB, CrC Cheshire	Good	Very good	Very good.
CuB, CuC Cheshire-Urban land	Good	Very good	Very good.
Fh. Fluvaquents and Medisaprists			
Fr Fredon	Fair	Fair	Poor.
HaA, HaB Haven	Good	Very good	Very good.
HbB Haven-Urban land	Good	Very good	Very good.
HcA, HcB, HcC Hinckley	Fair	Fair	Fair.

TABLE 6.--SOIL SUITABILITY FOR FLOWERS, VEGETABLES, AND FRUIT--Continued

Soil name and map symbol	Perennial flowers	Annual flowers and vegetables	Tree fruit and small fruit
HcD Hinckley	Poor	Poor	Fair.
HdB Hinckley-Urban land	Fair	Fair	Fair.
HlF Hollis-Rock outcrop	Poor	Very poor	Very poor.
HoC, HoD, HoF Holyoke-Rock outcrop	Poor	Very poor	Very poor.
HuC Holyoke-Urban land	Poor	Very poor	Very poor.
Ip. Ipswich			
Pa Palms	Very poor	Very poor	Very poor.
PnB, PnC Paxton	Good	Very good	Very good.
PsC Paxton	Poor	Poor	Poor.
PsE Paxton	Poor	Very poor	Very poor.
Ra Rippowam	Very poor	Very poor	Very poor.
ReA, ReB Riverhead	Good	Good	Very good.
ReC Riverhead	Fair	Fair	Good.
ReD Riverhead	Poor	Poor	Fair.
RuB Riverhead-Urban land	Good	Good	Very good.
RuC Riverhead-Urban land	Fair	Fair	Good.
RuD Riverhead-Urban land	Poor	Poor	Fair.
Sa Sloan	Poor	Very poor	Very poor.
Wa Wallington	Fair	Fair	Poor.
Wc Watchaug	Fair	Good	Fair.
WeA, WeB Wethersfield	Good	Very good	Very good.

TABLE 6.--SOIL SUITABILITY FOR FLOWERS, VEGETABLES, AND FRUIT--Continued

Soil name and map symbol	Perennial flowers	Annual flowers and vegetables	Tree fruit and small fruit
WeC Wethersfield	Good	Good	Good.
WeD Wethersfield	Fair	Fair	Fair.
WuB Wethersfield-Urban land	Good	Very good	Very good.
WuC Wethersfield-Urban land	Good	Good	Good.
WuD Wethersfield-Urban land	Fair	Fair	Fair.
YaB Yalesville	Good	Good	Good.
YaC Yalesville	Good	Fair	Good.
YaD Yalesville	Fair	Poor	Fair.
YuB Yalesville-Urban land	Good	Good	Good.
YuC Yalesville-Urban land	Good	Fair	Good.
YuD Yalesville-Urban land	Fair	Poor	Fair.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER

(Absence of an entry indicates that the soil was not rated and requires onsite investigation)

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
Aa: Adrian	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rosebay-rhododendron, Christmas fern, bugleweed, lilyturf.
Ad: Alden	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rhododendron, Christmas fern, bugleweed, lilyturf.
Ca: Carlisle	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rhododendron, Christmas fern, bugleweed, lilyturf.
CeB, CeC, CeD, ChC, ChE, ChF, CkC, CkD, CmB, CmD: Charlton	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
CoC, CoD------------ Chatfield	Honeylocust, golden raintree, hawthorn, Amur maple, Tallhedge glossy buckthorn, white poplar, northern red oak, Turkish filbert, American beech, black locust, white ash, crabapple, red maple, black birch.	Japanese black pine, lacebark pine, eastern white pine, red pine, eastern redcedar, American holly.	Sumac, bristly locust, rugosa rose, redstem dogwood, forsythia, diervilla, Japanese honeysuckle, lowbush blueberry, Japanese barberry, sweetfern, Scotch broom, aralia, California privet, autumn olive, cotoneaster, Anthony Waterer spirea, fragrant sumac, sweet pepperbush, highbush blueberry, witchhazel, bayberry, pinxterbloom, Virginia creeper.	Mountain laurel, juniper.
CrB, CrC, CuB, CuC-- Cheshire	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.
Fh------------------ Fluvaquents and Medisaprists	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae----	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rosebay-rhododendron, Christmas fern, bugleweed, lilyturf.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
Fr------------------ Fredon	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae----	Redosier dogwood, winterberry, fringetree, chokeberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, lowbush blueberry, fern, yellow root, plantain lily.	Inkberry, Christmas fern, bugleweed, lilyturf.
HaA, HaB, HbB------- Haven	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.
HcA, HcB, HcC, HcD, HdB---------------- Hinckley	Shadbush--------------	Japanese black pine, eastern redcedar, American holly.	Japanese barberry, bittersweet, Scotch broom, rugosa rose, chokeberry, autumn olive, Virginia creeper, bayberry, dusty miller, American beachgrass, coastal panicgrass.	Shore juniper, eastern redcedar.
HlF----------------- Hollis	Honeylocust, golden raintree, hawthorn, Amur maple, Tallhedge glossy buckthorn, white poplar, northern red oak, Turkish filbert, American beech, black locust, white ash, crabapple, red maple, black birch.	Japanese black pine, lacebark pine, eastern white pine, red pine, eastern redcedar, American holly.	Sumac, bristly locust, rugosa rose, redstem dogwood, forsythia, bush honeysuckle, Japanese honeysuckle, lowbush blueberry, Japanese barberry, sweetfern, Scotch broom, aralia, California privet, autumn olive, cotoneaster, Anthony Waterer spirea, fragrant sumac, sweet pepperbush, highbush blueberry, witchhazel, bayberry, pinxterbloom, Virginia creeper.	Mountain laurel, juniper.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
HoC, HoD, HoF, HuC-- Holyoke	Honeylocust, golden raintree, hawthorn, Amur maple, Tallhedge glossy buckthorn, white poplar, northern red oak, Turkish filbert, American beech, black locust, white ash, crabapple, red maple, black birch.	Japanese black pine, lacebark pine, eastern white pine, red pine, eastern redcedar, American holly.	Sumac, bristly locust, rugosa rose, redstem dogwood, forsythia, bush honeysuckle, Japanese honeysuckle, lowbush blueberry, sweetfern, Japanese barberry, Scotch broom, aralia, California privet, autumn olive, cotoneaster, Anthony Waterer spirea, fragrant sumac, sweet pepperbush, highbush blueberry, witchhazel, bayberry, pinxterbloom, Virginia creeper.	Mountain laurel, juniper.
Ip----------------- Ipswich	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	English arborvitae----	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rosebay-rhododendron, Christmas fern, bugleweed, lilyturf.
Pa----------------- Palms	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	English arborvitae----	Winged euonymus, redosier dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rosebay-rhododendron, Christmas fern, bugleweed, lilyturf.
PnB, PnC, PsC, PsE-- Paxton	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
Ra: Rippowam	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	English arborvitae	Redosier dogwood, winterberry, fringetree, chokeberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, lowbush blueberry, fern, yellow root, plantain lily.	Inkberry, Christmas fern, bugleweed, lilyturf.
ReA, ReB, ReC, ReD, RuB, RuC, RuD: Riverhead	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.
Sa: Sloan	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae	Winged euonymus, red dogwood, winterberry, fringetree, chokeberry, lowbush blueberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, fern, yellow root, plantain lily.	Inkberry, rosebay-rhododendron, Christmas fern, bugleweed, lilyturf.
Wa: Wallington	Pin oak, willow oak, sweetgum, tuliptree, English oak, shadbush, sourgum, red maple.	Eastern arborvitae	Redosier dogwood, winterberry, fringetree, chokeberry, sweet pepperbush, swamp azalea, highbush blueberry, buttonbush, lowbush blueberry, fern, yellow root, plantain lily.	Inkberry, Christmas fern, bugleweed.

TABLE 7.--SOIL SUITABILITY FOR ORNAMENTAL TREES, SHRUBS, AND GROUND COVER--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs and ground cover	Evergreen shrubs and ground cover
Wc: Watchaug	Flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, tuliptree, honeylocust, sourwood, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, scarlet oak, white ash, American hornbeam, shadbush, sweetgum.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Washington hawthorn, redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, inkberry, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.
WeA, WeB, WeC, WeD, WuB, WuC, WuD: Wethersfield	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, flowering dogwood, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.
YaB, YaC, YaD, YuB, YuC, YuD: Yalesville	European beech, flowering crabapple, ginkgo, littleleaf linden, pin oak, Japanese pagodatree, Bradford pear, golden raintree, yellowwood, zelkova, sawtooth oak, Crimean linden, honeylocust, sourwood, Kousa dogwood, tuliptree, Amur corktree, Chinese elm, northern red oak, American beech, black birch, shadbush, sweetgum, white ash, American hornbeam, scarlet oak.	Atlas cedar, white fir, eastern hemlock, eastern white pine, oriental spruce, Douglas fir, Nordmann fir, Himalayan pine, Swiss stone pine, American holly.	Redosier dogwood, forsythia, Amur honeysuckle, winterberry, fringetree, chokeberry, abelia, cornelian cherry dogwood, viburnum, Washington hawthorn, fothergilla, deciduous azalea, winged euonymus, witchhazel, highbush blueberry, cotoneaster, plantain lily.	Inkberry, azalea, Japanese holly, mountain laurel, Mugo pine, rhododendron, yew, English holly, Japanese pieris, leucothoe, evergreen euonymus, pachysandra, English ivy, juniper, periwinkle.

TABLE 8.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Grass-legume hay	Pasture
		Tons	AUM*
Aa Adrian	Vw	---	---
Ad Alden	IVw	---	---
Ca Carlisle	Vw	---	---
CeB Charlton	IIe	4.5	---
CeC Charlton	IIIe	4.0	---
CeD Charlton	IVe	3.5	---
ChC Charlton	VIs	---	---
ChE, ChF Charlton	VIIs	---	---
CkC** Charlton-Rock outcrop	VIs	---	---
CkD** Charlton-Rock outcrop	VIIs	---	---
CmB**, CmD**. Charlton-Urban land			
CoC**, CoD** Chatfield-Rock outcrop	VIs	---	---
CrB Cheshire	IIe	4.0	---
CrC Cheshire	IIIe	4.0	---
CuB**, CuC**. Cheshire-Urban land			

See footnotes at end of table.

TABLE 8.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Grass-legume hay	Pasture
		Tons	AUM*
Fh-------------- Fluvaquents and Medisaprists	Vw	---	---
Fr-------------- Fredon	IIIw	3.0	5.7
HaA------------- Haven	I	4.5	8.5
HaB------------- Haven	IIe	4.5	8.5
HbB**. Haven-Urban land			
HcA, HcB-------- Hinckley	IIIs	2.0	---
HcC------------- Hinckley	IVs	---	---
HcD------------- Hinckley	VIs	---	---
HdB**. Hinckley-Urban land			
HlF**----------- Hollis-Rock outcrop	VIIs	---	---
HoC**, HoD**---- Holyoke-Rock outcrop	VIs	---	---
HoF**----------- Holyoke-Rock outcrop	VIIs	---	---
HuC**. Holyoke-Urban land-Rock outcrop			
Ip-------------- Ipswich	VIIIw	---	---
Pa-------------- Palms	Vw	---	---
PnB------------- Paxton	IIe	4.0	---
PnC------------- Paxton	IIIe	4.0	---

See footnotes at end of table.

TABLE 8.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Grass-legume hay	Pasture
		Tons	AUM*
PsC------------- Paxton	VIs	---	---
PsE------------- Paxton	VIIs	---	---
Pt**, Pv**. Pits			
Ra-------------- Rippowam	IVw	3.0	---
ReA, ReB-------- Riverhead	IIs	3.0	5.5
ReC------------- Riverhead	IIIe	3.0	5.5
ReD------------- Riverhead	IVe	---	5.0
RuB**, RuC**, RuD**. Riverhead-Urban land			
Sa-------------- Sloan	IIIw	5.0	5.0
Ur**, Us, Uw. Udorthents			
Ux**. Urban land			
Wa-------------- Wallington	IIIw	3.0	6.5
Wc-------------- Watchaug	IIw	4.0	7.5
WeA------------- Wethersfield	I	4.0	---
WeB------------- Wethersfield	IIe	4.0	---
WeC------------- Wethersfield	IIIe	4.0	---
WeD------------- Wethersfield	IVe	3.5	---
WuB**, WuC**, WuD**. Wethersfield-Urban land			

See footnotes at end of table.

TABLE 8.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Grass-legume hay	Pasture
		Tons	AUM*
YaB------------- Yalesville	IIe	4.0	---
YaC------------- Yalesville	IIIe	4.0	---
YaD------------- Yalesville	IVe	3.5	---
YuB**, YuC**, YuD**. Yalesville-Urban land			

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Subsoil (s)
		Acres	Acres	Acres
I	325	---	---	---
II	32,309	28,269	2,417	1,623
III	14,162	11,290	1,017	1,855
IV	8,267	4,519	3,593	155
V	2,026	---	2,026	---
VI	28,308	---	---	28,308
VII	8,505	---	---	8,505
VIII	16,003	---	757	15,246

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Aa Adrian	2W	Slight	Severe	Severe	Severe	Silver maple	78	32	
						Red maple	53	34	
						White ash	69	42	
						Quaking aspen	60	64	
						Tamarack	45	35	
						Green ash	69	32	
Ad Alden	2W	Slight	Severe	Severe	Severe	Red maple	50	32	White spruce, northern white-cedar.
Ca Carlisle	2W	Slight	Severe	Severe	Severe	Red maple	56	36	
						White ash	---	---	
						Green ash	---	---	
						Quaking aspen	---	---	
						Swamp white oak	---	---	
						Silver maple	82	36	
CeB, CeC Charlton	3A	Slight	Slight	Slight	Slight	Northern red oak	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine	65	136	
						Red pine	70	128	
						Red spruce	50	109	
						Red maple	55	35	
						Shagbark hickory	---	---	
						Sugar maple	55	35	
CeD Charlton	3R	Moderate	Moderate	Slight	Slight	Northern red oak	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine	65	136	
						Red pine	70	128	
						Red spruce	50	109	
						Red maple	55	35	
						Shagbark hickory	---	---	
						Sugar maple	55	35	
ChC Charlton	3A	Slight	Slight	Slight	Slight	Northern red oak	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine	65	136	
						Red pine	70	128	
						Red spruce	50	109	
						Red maple	55	35	
						Shagbark hickory	---	---	
ChE Charlton	3R	Moderate	Moderate	Slight	Slight	Northern red oak	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine	65	136	
						Red pine	70	128	
						Red spruce	50	109	
						Red maple	55	35	
						Shagbark hickory	---	---	

See footnotes at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
ChF------------- Charlton	3R	Severe	Severe	Slight	Slight	Northern red oak----	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine--	65	136	
						Red pine------------	70	128	
						Red spruce----------	50	109	
						Red maple-----------	55	35	
						Shagbark hickory----	---	---	
CkC**:									
Charlton-------	3A	Slight	Slight	Slight	Slight	Northern red oak----	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine--	65	136	
						Red pine------------	70	128	
						Red spruce----------	50	109	
						Red maple-----------	55	35	
						Shagbark hickory----	---	---	
CkD**:									
Charlton-------	3R	Moderate	Moderate	Slight	Slight	Northern red oak----	65	47	Eastern white pine, red pine, white spruce, eastern hemlock, European larch.
						Eastern white pine--	65	136	
						Red pine------------	70	128	
						Red spruce----------	50	109	
						Red maple-----------	55	35	
						Shagbark hickory----	---	---	
CoC**:									
Chatfield------	3A	Slight	Slight	Slight	Slight	Sugar maple---------	65	40	Eastern white pine, red pine, European larch, Norway spruce.
						Northern red oak----	70	52	
						White ash-----------	75	47	
Rock outcrop.									
CoD**:									
Chatfield------	3R	Slight	Moderate	Slight	Slight	Sugar maple---------	65	40	Eastern white pine, red pine, European larch, Norway spruce.
						Northern red oak----	70	52	
						White ash-----------	75	47	
Rock outcrop.									
CrB, CrC-------- Cheshire	3A	Slight	Slight	Slight	Slight	Northern red oak----	60	43	Eastern white pine, eastern hemlock, European larch.
						Eastern white pine--	65	136	
						Shagbark hickory----	---	---	
						Sugar maple---------	---	---	
Fr-------------- Fredon	3W	Slight	Severe	Severe	Severe	Northern red oak----	60	43	Yellow poplar, eastern white pine, white spruce, Norway spruce.
						Yellow poplar-------	80	71	
						Eastern white pine--	70	151	
						Red maple-----------	70	43	

See footnotes at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
HaA, HaB-------- Haven	12A	Slight	Slight	Slight	Slight	Eastern white pine--	75	156	Eastern white pine, red pine, Norway spruce, European larch.
						Northern red oak----	55	38	
						Sugar maple---------	65	40	
						Red pine------------	75	142	
HcA, HcB, HcC--- Hinckley	8S	Slight	Slight	Severe	Slight	Eastern white pine--	60	121	Eastern white pine.
						Northern red oak----	49	33	
						Red pine------------	58	96	
						Sugar maple---------	57	36	
HcD------------- Hinckley	8S	Moderate	Moderate	Severe	Slight	Eastern white pine--	60	121	Eastern white pine.
						Northern red oak----	49	33	
						Red pine------------	58	96	
						Sugar maple---------	57	36	
HlF**: Hollis---------	2R	Severe	Severe	Moderate	Severe	Northern red oak----	47	32	Eastern white pine.
						Eastern white pine--	55	106	
						Sugar maple---------	56	36	
Rock outcrop.									
HoC**: Holyoke--------	2D	Slight	Slight	Moderate	Severe	Northern red oak----	47	32	Eastern white pine, red pine.
						Eastern white pine--	55	106	
						White ash-----------	---	---	
Rock outcrop.									
HoD**: Holyoke--------	2D	Moderate	Moderate	Moderate	Severe	Northern red oak----	47	32	Eastern white pine, red pine.
						Eastern white pine--	55	106	
						White ash-----------	---	---	
Rock outcrop.									
HoF**: Holyoke--------	2R	Severe	Severe	Moderate	Severe	Northern red oak----	47	32	Eastern white pine, red pine.
						Eastern white pine--	55	106	
						White ash-----------	---	---	
Rock outcrop.									
Pa-------------- Palms	2W	Slight	Severe	Severe	Severe	White ash-----------	51	33	
						Red maple-----------	51	33	
						Quaking aspen-------	56	56	
						Black willow--------	---	---	
						Silver maple--------	76	30	
PnB, PnC-------- Paxton	3A	Slight	Slight	Moderate	Slight	Northern red oak----	65	47	Red pine, eastern white pine, Norway spruce, European larch.
						Red pine------------	67	120	
						Eastern white pine--	66	139	
						Sugar maple---------	75	47	

See footnotes at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
PsC Paxton	3A	Slight	Slight	Slight	Moderate	Northern red oak	65	47	Red pine, eastern white pine, Norway spruce, European larch.
						Red pine	67	120	
						Eastern white pine	66	139	
						Sugar maple	75	47	
PsE Paxton	3R	Moderate	Moderate	Slight	Moderate	Northern red oak	65	47	Red pine, eastern white pine, Norway spruce, European larch.
						Red pine	67	120	
						Eastern white pine	66	139	
						Sugar maple	75	47	
Ra Rippowam	3W	Slight	Severe	Severe	Severe	Red maple	75	47	Eastern white pine, white spruce.
						Eastern white pine	65	136	
ReA, ReB, ReC Riverhead	3A	Slight	Slight	Slight	Slight	Sugar maple	63	39	Eastern white pine, Norway spruce, European larch.
						Northern red oak	70	52	
						Black cherry	70	43	
						Eastern white pine	75	156	
ReD Riverhead	3R	Slight	Moderate	Slight	Slight	Sugar maple	63	39	Eastern white pine, Norway spruce, European larch.
						Northern red oak	70	52	
						Black cherry	70	43	
						Eastern white pine	75	156	
Sa Sloan	5W	Slight	Severe	Severe	Severe	Pin oak	86	68	Red maple, green ash, eastern cottonwood, sweetgum, pin oak, swamp white oak.
						Swamp white oak	---	---	
						Red maple	---	---	
						Green ash	---	---	
						Eastern cottonwood	---	---	
Wa Wallington	3W	Slight	Moderate	Moderate	Moderate	Northern red oak	65	47	Eastern white pine, white spruce, Norway spruce.
						Sugar maple	65	40	
						White ash	75	47	
Wc Watchaug	10A	Slight	Slight	Slight	Slight	Eastern white pine	65	136	Eastern white pine.
						Northern red oak	65	47	
WeA, WeB, WeC Wethersfield	4D	Slight	Slight	Slight	Moderate	Northern red oak	74	56	Eastern white pine, European larch.
						Eastern white pine	75	156	
						Sugar maple	63	39	
						Yellow poplar	87	84	
WeD Wethersfield	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	74	56	Eastern white pine, European larch.
						Eastern white pine	75	156	
						Sugar maple	63	39	
						Yellow poplar	87	84	
YaB, YaC Yalesville	3D	Slight	Slight	Slight	Moderate	Northern red oak	60	43	Eastern white pine, European larch.
						Eastern white pine	65	136	
						Sugar maple	---	---	

See footnotes at end of table.

TABLE 10.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
YaD------------- Yalesville	3R	Moderate	Moderate	Slight	Moderate	Northern red oak---- Eastern white pine-- Sugar maple---------	60 65 ---	43 136 ---	Eastern white pine, European larch.

---

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Aa Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Ad Alden	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding.
Ca Carlisle	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
CeB Charlton	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
CeC Charlton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CeD Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
ChC Charlton	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight	Moderate: large stones, slope.
ChE, ChF Charlton	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
CkC*: Charlton	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight	Moderate: large stones, slope.
Rock outcrop.					
CkD*: Charlton	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.
Rock outcrop.					
CmB*: Charlton	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					
CmD*: Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CoC*:					
Chatfield	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Slight	Moderate: small stones, large stones, slope.
Rock outcrop.					
CoD*:					
Chatfield	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope.
Rock outcrop.					
CrB Cheshire	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
CrC Cheshire	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
CuB*:					
Cheshire	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
Urban land.					
CuC*:					
Cheshire	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Urban land.					
Fh*:					
Fluvaquents.					
Medisaprists.					
Fr Fredon	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HaA Haven	Slight	Slight	Moderate: small stones.	Slight	Slight.
HaB Haven	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
HbB*:					
Haven	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HcA, HcB Hinckley	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.
HcC Hinckley	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: droughty.
HcD Hinckley	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
HdB*: Hinckley	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Severe: droughty.
Urban land.					
HlF*: Hollis	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
HoC*: Holyoke	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Slight	Severe: thin layer.
Rock outcrop.					
HoD*: Holyoke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
HoF*: Holyoke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
HuC*: Holyoke	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
Urban land.					
Rock outcrop.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ip-------------------- Ipswich	Severe: ponding, flooding, excess humus.	Severe: ponding, excess humus, excess salt.	Severe: ponding, flooding, excess humus.	Severe: ponding, excess humus.	Severe: excess salt, excess sulfur, ponding.
Pa-------------------- Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
PnB------------------- Paxton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight----------	Slight.
PnC------------------- Paxton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
PsC------------------- Paxton	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Slight----------	Moderate: large stones, slope.
PsE------------------- Paxton	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Pt*, Pv*. Pits					
Ra-------------------- Rippowam	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
ReA------------------- Riverhead	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
ReB------------------- Riverhead	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
ReC------------------- Riverhead	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
ReD------------------- Riverhead	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
RuB*: Riverhead------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Urban land.					
RuC*: Riverhead------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Urban land.					

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RuD*:					
Riverhead	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					
Sa Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ur*, Us, Uw. Udorthents					
Ux*. Urban land					
Wa Wallington	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wc Watchaug	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Moderate: wetness.	Moderate: wetness.
WeA, WeB Wethersfield	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Moderate: small stones.
WeC Wethersfield	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope.	Slight	Moderate: small stones, slope.
WeD Wethersfield	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
WuB*:					
Wethersfield	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight	Moderate: small stones.
Urban land.					
WuC*:					
Wethersfield	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope.	Slight	Moderate: small stones, slope.
Urban land.					
WuD*:					
Wethersfield	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					
YaB Yalesville	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
YaC: Yalesville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
YaD: Yalesville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
YuB*:					
Yalesville	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					
YuC*:					
Yalesville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Urban land.					
YuD*:					
Yalesville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Aa----------------- Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ad----------------- Alden	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ca----------------- Carlisle	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CeB---------------- Charlton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CeC---------------- Charlton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CeD---------------- Charlton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ChC, ChE, ChF------ Charlton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
CkC*, CkD*:										
Charlton----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
CmB*:										
Charlton----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
CmD*:										
Charlton----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
CoC*, CoD*:										
Chatfield---------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
CrB---------------- Cheshire	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC---------------- Cheshire	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CuB*:										
Cheshire----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CuB*: Urban land.										
CuC*: Cheshire----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
Fh*: Fluvaquents.										
Medisaprists.										
Fr----------------- Fredon	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
HaA---------------- Haven	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaB---------------- Haven	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HbB*: Haven-------------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
HcA, HcB, HcC, HcD- Hinckley	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
HdB*: Hinckley----------	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
HlF*: Hollis------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
HoC*, HoD*, HoF*: Holyoke-----------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
HuC*: Holyoke-----------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
Rock outcrop.										

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ip------------------ Ipswich	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Pa------------------ Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
PnB----------------- Paxton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PnC----------------- Paxton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PsC, PsE------------ Paxton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Pt*, Pv*. Pits										
Ra------------------ Rippowam	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
ReA----------------- Riverhead	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ReB, ReC------------ Riverhead	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ReD----------------- Riverhead	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
RuB*, RuC*: Riverhead----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
RuD*: Riverhead----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
Sa------------------ Sloan	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Ur*, Us, Uw. Udorthents										
Ux*. Urban land										
Wa------------------ Wallington	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wc------------------ Watchaug	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
WeA----------------- Wethersfield	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WeB---------------- Wethersfield	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeC---------------- Wethersfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeD---------------- Wethersfield	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WuB*:										
Wethersfield------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
WuC*:										
Wethersfield------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
WuD*:										
Wethersfield------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										
YaB---------------- Yalesville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
YaC---------------- Yalesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
YaD---------------- Yalesville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
YuB*:										
Yalesville--------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
YuC*:										
Yalesville--------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
YuD*:										
Yalesville--------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Aa Adrian	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Ad Alden	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Ca Carlisle	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
CeB Charlton	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
CeC Charlton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CeD Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ChC Charlton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, slope.
ChE, ChF Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CkC*: Charlton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: large stones, slope.
Rock outcrop.						
CkD*: Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
CmB*: Charlton	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Urban land.						
CmD*: Charlton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Urban land.						

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CoC*:						
Chatfield	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.	Moderate: small stones, large stones, slope.
Rock outcrop.						
CoD*:						
Chatfield	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
CrB Cheshire	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones.
CrC Cheshire	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
CuB*:						
Cheshire	Slight	Slight	Slight	Moderate: slope.	Slight	Moderate: small stones.
Urban land.						
CuC*:						
Cheshire	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: small stones, slope.
Urban land.						
Fh*:						
Fluvaquents.						
Medisaprists.						
Fr Fredon	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
HaA Haven	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
HaB Haven	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
HbB*:						
Haven	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Urban land.						
HcA Hinckley	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HcB Hinckley	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
HcC Hinckley	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
HcD Hinckley	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
HdB*:						
Hinckley	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
Urban land.						
HlF*:						
Hollis	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
HoC*:						
Holyoke	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
HoD*, HoF*:						
Holyoke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
HuC*:						
Holyoke	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Urban land.						
Rock outcrop.						
Ip Ipswich	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
Pa Palms	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PnB Paxton	Moderate: dense layer, wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Slight.
PnC Paxton	Moderate: dense layer, wetness, slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: slope.
PsC Paxton	Moderate: dense layer, wetness, slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: large stones, slope.
PsE Paxton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pt*, Pv*. Pits						
Ra Rippowam	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
ReA Riverhead	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
ReB Riverhead	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
ReC Riverhead	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
ReD Riverhead	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RuB*:						
Riverhead	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Urban land.						
RuC*:						
Riverhead	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Urban land.						
RuD*:						
Riverhead	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Urban land.						

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Sa---------------- Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
Ur*, Us, Uw. Udorthents						
Ux*. Urban land						
Wa---------------- Wallington	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Wc---------------- Watchaug	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
WeA--------------- Wethersfield	Moderate: dense layer, wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: small stones.
WeB--------------- Wethersfield	Moderate: dense layer, wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: small stones.
WeC--------------- Wethersfield	Moderate: dense layer, wetness, slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: small stones, slope.
WeD--------------- Wethersfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WuB*: Wethersfield-----	Moderate: dense layer, wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: small stones.
Urban land.						
WuC*: Wethersfield-----	Moderate: dense layer, wetness, slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: small stones, slope.
Urban land.						
WuD*: Wethersfield-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Urban land.						
YaB--------------- Yalesville	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Slight.

See footnote at end of table.

TABLE 13.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
YaC Yalesville	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope.
YaD Yalesville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
YuB*:						
Yalesville	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Slight.
Urban land.						
YuC*:						
Yalesville	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Moderate: slope.
Urban land.						
YuD*:						
Yalesville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aa Adrian	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Ad Alden	Severe: ponding, percs slowly.	Slight	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ca Carlisle	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
CeB Charlton	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
CeC Charlton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
CeD Charlton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
ChC Charlton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
ChE, ChF Charlton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
CkC*: Charlton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
Rock outcrop.					
CkD*: Charlton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rock outcrop.					
CmB*: Charlton	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Urban land.					

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CmD*:					
Charlton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Urban land.					
CoC*:					
Chatfield	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Rock outcrop.					
CoD*:					
Chatfield	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Rock outcrop.					
CrB Cheshire	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
CrC Cheshire	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
CuB*:					
Cheshire	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Urban land.					
CuC*:					
Cheshire	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
Urban land.					
Fh*:					
Fluvaquents.					
Medisaprists.					
Fr Fredon	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
HaA, HaB Haven	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HbB*: Haven	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, small stones, too sandy.
Urban land.					
HcA, HcB Hinckley	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
HcC Hinckley	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
HcD Hinckley	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
HdB*: Hinckley	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Urban land.					
HlF*: Hollis	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope, thin layer.
Rock outcrop.					
HoC*: Holyoke	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Rock outcrop.					
HoD*, HoF*: Holyoke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
Rock outcrop.					
HuC*: Holyoke	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HuC*:					
Urban land.					
Rock outcrop.					
Ip------------------ Ipswich	Severe: flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus, excess salt.
Pa------------------ Palms	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
PnB----------------- Paxton	Severe: percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
PnC, PsC------------ Paxton	Severe: percs slowly.	Severe: slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Fair: small stones, slope, wetness.
PsE----------------- Paxton	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Pt*, Pv*. Pits					
Ra------------------ Rippowam	Severe: flooding, wetness, poor filter.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
ReA, ReB------------ Riverhead	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ReC----------------- Riverhead	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ReD----------------- Riverhead	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: seepage, too sandy, slope.
RuB*:					
Riverhead-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
RuC*:					
Riverhead-----------	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RuC*:					
Urban land.					
RuD*:					
Riverhead----------	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: seepage, too sandy, slope.
Urban land.					
Sa----------------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ur*, Us, Uw. Udorthents					
Ux*. Urban land					
Wa----------------- Wallington	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Wc----------------- Watchaug	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: small stones, wetness.
WeA---------------- Wethersfield	Severe: percs slowly.	Slight----------	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
WeB---------------- Wethersfield	Severe: percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
WeC---------------- Wethersfield	Severe: percs slowly.	Severe: slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Fair: small stones, slope, wetness.
WeD---------------- Wethersfield	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
WuB*:					
Wethersfield-------	Severe: percs slowly.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
Urban land.					
WuC*:					
Wethersfield-------	Severe: percs slowly.	Severe: slope.	Moderate: wetness, slope.	Moderate: wetness, slope.	Fair: small stones, slope, wetness.
Urban land.					

See footnote at end of table.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WuD*:					
Wethersfield-------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Urban land.					
YaB---------------- Yalesville	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
YaC---------------- Yalesville	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
YaD---------------- Yalesville	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
YuB*:					
Yalesville---------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Urban land.					
YuC*:					
Yalesville---------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
Urban land.					
YuD*:					
Yalesville---------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aa Adrian	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Ad Alden	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, small stones, area reclaim.
Ca Carlisle	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
CeB Charlton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
CeC Charlton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
CeD Charlton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
ChC Charlton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
ChE, ChF Charlton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CkC*: Charlton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Rock outcrop.				
CkD*: Charlton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop.				
CmB*: Charlton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Urban land.				
CmD*: Charlton	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CmD*:				
Urban land.				
CoC*:				
Chatfield	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Rock outcrop.				
CoD*:				
Chatfield	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
CrB Cheshire	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
CrC Cheshire	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
CuB*:				
Cheshire	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Urban land.				
CuC*:				
Cheshire	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Urban land.				
Fh*:				
Fluvaquents.				
Medisaprists.				
Fr Fredon	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim, wetness.
HaA, HaB Haven	Good	Probable	Probable	Poor: too sandy, area reclaim.
HbB*:				
Haven	Good	Probable	Probable	Poor: too sandy, area reclaim.
Urban land.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HcA, HcB, HcC Hinckley	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
HcD Hinckley	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, slope.
HdB*:				
Hinckley	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Urban land.				
HlF*:				
Hollis	Poor: area reclaim, thin layer, slope.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer, slope.
Rock outcrop.				
HoC*:				
Holyoke	Poor: area reclaim, thin layer.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer.
Rock outcrop.				
HoD*:				
Holyoke	Poor: area reclaim, thin layer.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer, slope.
Rock outcrop.				
HoF*:				
Holyoke	Poor: area reclaim, thin layer, slope.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer slope.
Rock outcrop.				
HuC*:				
Holyoke	Poor: area reclaim, thin layer.	Improbable: excess fines, thin layer.	Improbable: excess fines, thin layer.	Poor: area reclaim, thin layer.
Urban land.				
Rock outcrop.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ip Ipswich	Poor: low strength, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, excess salt, wetness.
Pa Palms	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
PnB Paxton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
PnC, PsC Paxton	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
PsE Paxton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Pt*, Pv*. Pits				
Ra Rippowam	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
ReA, ReB, ReC Riverhead	Good	Probable	Probable	Poor: small stones.
ReD Riverhead	Fair: slope.	Probable	Probable	Poor: small stones, slope.
RuB*, RuC*: Riverhead	Good	Probable	Probable	Poor: small stones.
Urban land.				
RuD*: Riverhead	Fair: slope.	Probable	Probable	Poor: small stones, slope.
Urban land.				
Sa Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ur*, Us, Uw. Udorthents				
Ux*. Urban land				
Wa Wallington	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wc-------------------- Watchaug	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
WeA, WeB-------------- Wethersfield	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
WeC------------------- Wethersfield	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
WeD------------------- Wethersfield	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
WuB*: Wethersfield---------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Urban land.				
WuC*: Wethersfield---------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Urban land.				
WuD*: Wethersfield---------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Urban land.				
YaB------------------- Yalesville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
YaC------------------- Yalesville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer, slope.
YaD------------------- Yalesville	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
YuB*: Yalesville-----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Urban land.				

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
YuC*:				
Yalesville-----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer, slope.
Urban land.				
YuD*:				
Yalesville-----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Aa Adrian	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
Ad Alden	Slight	Severe: piping, wetness.	Slight	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Ca Carlisle	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
CeB Charlton	Severe: seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Favorable	Favorable.
CeC, CeD, ChC, ChE, ChF Charlton	Severe: slope, seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope.
CkC*, CkD*: Charlton	Severe: slope, seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope.
Rock outcrop.						
CmB*: Charlton	Severe: seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Urban land.						
CmD*: Charlton	Severe: slope, seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope	Slope.
Urban land.						
CoC*, CoD*: Chatfield	Severe: slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop.						
CrB Cheshire	Severe: seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
CrC Cheshire	Severe: seepage, slope.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
CuB*:						
Cheshire---------	Severe: seepage.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Urban land.						
CuC*:						
Cheshire---------	Severe: seepage, slope.	Moderate: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Urban land.						
Fh*:						
Fluvaquents.						
Medisaprists.						
Fr---------------- Fredon	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, too sandy.	Wetness.
HaA, HaB---------- Haven	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
HbB*:						
Haven------------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily.
Urban land.						
HcA, HcB---------- Hinckley	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
HcC, HcD---------- Hinckley	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
HdB*:						
Hinckley---------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
Urban land.						
HlF*:						
Hollis-----------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop.						
HoC*, HoD*, HoF*:						
Holyoke----------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
HuC*:						
Holyoke----------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Urban land.						
Rock outcrop.						
Ip---------------- Ipswich	Severe: seepage.	Severe: excess humus, ponding, excess salt.	Severe: salty water.	Ponding, flooding, excess salt.	Ponding--------	Wetness, excess salt.
Pa---------------- Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
PnB--------------- Paxton	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Rooting depth, percs slowly.	Rooting depth, percs slowly.
PnC, PsC, PsE----- Paxton	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth, percs slowly.	Slope, rooting depth, percs slowly.
Pt*, Pv*. Pits						
Ra---------------- Rippowam	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, frost action, cutbanks cave.	Wetness, too sandy, poor outlets.	Wetness.
ReA, ReB---------- Riverhead	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy------	Favorable.
ReC, ReD---------- Riverhead	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope.
RuB*:						
Riverhead--------	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy------	Favorable.
Urban land.						
RuC*, RuD*:						
Riverhead--------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope.
Urban land.						
Sa---------------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Ur*, Us, Uw. Udorthents						
Ux*. Urban land						

See footnote at end of table.

TABLE 16.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Wa----------------- Wallington	Slight-----------	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Wc----------------- Watchaug	Severe: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Frost action---	Wetness--------	Favorable.
WeA---------------- Wethersfield	Slight----------	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth.	Rooting depth, percs slowly.
WeB---------------- Wethersfield	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth.	Rooting depth, percs slowly.
WeC, WeD---------- Wethersfield	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth, percs slowly.	Slope, rooting depth, percs slowly.
WuB*: Wethersfield-----	Moderate: slope.	Severe: piping.	Severe: no water.	Deep to water	Percs slowly, rooting depth.	Rooting depth, percs slowly.
Urban land.						
WuC*, WuD*: Wethersfield-----	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, rooting depth, percs slowly.	Slope, rooting depth, percs slowly.
Urban land.						
YaB---------------- Yalesville	Severe: seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.
YaC, YaD---------- Yalesville	Severe: seepage, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
YuB*: Yalesville-------	Severe: seepage.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.
Urban land.						
YuC*, YuD*: Yalesville-------	Severe: seepage, slope.	Severe: thin layer, piping.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aa Adrian	0-26	Sapric material	PT	A-8	---	---	---	---	---	---	---
	26-60	Sand, loamy coarse sand, coarse gravelly sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
Ad Alden	0-9	Silt loam	ML, OL	A-7, A-5	0	80-100	75-100	65-95	55-85	40-50	5-15
	9-33	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-95	55-85	20-35	5-15
	33-60	Loam, fine sandy loam, silty clay loam.	CL, GC, SC, CL-ML	A-2, A-4, A-6	0-5	60-95	50-90	45-90	30-85	20-35	5-15
Ca Carlisle	0-80	Sapric material	PT	A-8	---	---	---	---	---	---	---
CeB, CeC, CeD Charlton	0-5	Fine sandy loam	SM, ML	A-2, A-4	0-10	85-95	75-90	50-85	25-65	<25	NP-5
	5-38	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	65-90	60-90	40-80	20-65	<25	NP-3
	38-60	Very gravelly sandy loam, gravelly fine sandy loam, loam.	SM, ML	A-2, A-4	5-25	60-90	55-85	40-75	20-50	---	NP
ChC, ChE, ChF Charlton	0-5	Fine sandy loam	SM, ML	A-2, A-4	10-20	75-95	70-90	60-85	30-70	<25	NP-5
	5-38	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	65-90	60-90	50-80	20-65	<25	NP-3
	38-60	Fine sandy loam, gravelly fine sandy loam, very gravelly sandy loam.	SM, ML	A-2, A-4	5-25	60-90	55-85	40-75	20-50	---	NP
CkC*, CkD*:											
Charlton	0-5	Fine sandy loam	SM, ML	A-2, A-4	10-20	75-95	70-90	60-85	30-70	<25	NP-5
	5-38	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	65-90	60-90	50-80	20-65	<25	NP-3
	38-60	Fine sandy loam, gravelly fine sandy loam, very gravelly sandy loam.	SM, ML	A-2, A-4	5-25	60-90	55-85	40-75	20-50	---	NP
Rock outcrop.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CmB*, CmD*:											
Charlton--------	0-5	Fine sandy loam	SM, ML	A-2, A-4	0-10	85-95	75-90	50-85	25-65	<25	NP-5
	5-38	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, ML	A-2, A-4	0-15	65-90	60-90	40-80	20-65	<25	NP-3
	38-60	Gravelly sandy loam, gravelly fine sandy loam, loam.	SM, ML	A-2, A-4	5-25	60-90	55-85	40-75	20-50	---	NP
Urban land.											
CoC*, CoD*:											
Chatfield-------	0-9	Gravelly sandy loam.	SM, GM, GM-GC, SM-SC	A-4, A-2, A-1	5-10	55-80	50-75	30-65	15-50	10-20	1-6
	9-25	Loam, gravelly loam, gravelly sandy loam.	SM, ML, GM, CL-ML	A-4, A-2, A-1	0-10	60-95	55-90	33-85	15-75	10-20	1-6
	25-29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
CrB, CrC--------- Cheshire	0-10	Gravelly fine sandy loam.	SM, GM, ML	A-2, A-4	0-10	65-95	60-80	45-75	25-65	<35	NP-10
	10-22	Gravelly fine sandy loam, silt loam, loam.	SM, ML	A-2, A-4	0-15	85-95	70-95	50-85	25-70	<30	NP-6
	22-60	Gravelly sandy loam, fine sandy loam, gravelly fine sandy loam.	SM, GM	A-2, A-4	0-15	65-90	60-90	40-65	20-45	<25	NP-4
CuB*, CuC*:											
Cheshire--------	0-10	Gravelly fine sandy loam.	SM, GM, ML	A-2, A-4	0-10	65-95	60-80	45-75	25-65	<35	NP-10
	10-22	Gravelly fine sandy loam, silt loam, loam.	SM, ML	A-2, A-4	0-15	85-95	70-95	50-85	25-70	<30	NP-6
	22-60	Gravelly sandy loam, fine sandy loam, gravelly fine sandy loam.	SM, GM	A-2, A-4	0-15	65-90	60-90	40-65	20-45	<25	NP-4
Urban land.											
Fh*:											
Fluvaquents.											
Medisaprists.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Fr----------------- Fredon	0-10	Loam--------------	ML, CL, SC, SM	A-2, A-4, A-1	0-2	80-100	75-95	30-90	15-70	20-30	NP-10
	10-25	Fine sandy loam, silt loam, fine sandy loam.	SM, GC, ML, CL	A-2, A-4, A-1	0-2	60-100	50-95	30-85	15-70	20-30	NP-10
	25-60	Stratified very gravelly sand to loamy fine sand.	GP, GM, GW, GW-GM	A-1, A-2	0-5	30-90	25-85	10-60	0-35	---	NP
HaA, HaB---------- Haven	0-5	Loam--------------	ML, SM	A-4	0	80-100	75-100	65-100	40-90	<25	NP-4
	5-28	Gravelly loam, loam, gravelly sandy loam.	ML, SM	A-4, A-2, A-1	0	60-100	55-95	40-95	20-85	<25	NP-4
	28-60	Stratified loamy fine sand to gravel.	SP, SW, GP, SM	A-1, A-3, A-2	0-20	30-90	25-85	10-60	1-25	<10	NP
HbB*: Haven------------	0-5	Loam--------------	ML, SM	A-4	0	80-100	75-100	65-100	40-90	<25	NP-4
	5-28	Gravelly loam, loam, gravelly sandy loam.	ML, SM	A-4, A-2, A-1	0	60-100	55-95	40-95	20-85	<25	NP-4
	28-60	Stratified loamy fine sand to gravel.	SP, SW, GP, SM	A-1, A-3, A-2	0-20	30-90	25-85	10-60	1-25	<10	NP
Urban land.											
HcA, HcB, HcC, HcD-------------- Hinckley	0-4	Gravelly loamy sand.	SM, SP-SM, GM, GP-GM	A-1, A-2	0-10	60-85	50-75	25-60	10-35	<20	NP
	4-17	Gravelly loamy sand, loamy fine sand, very gravelly loamy coarse sand.	SM, GM, GP-GM, SP-SM	A-1, A-2, A-3	0-20	50-95	30-85	15-70	2-30	<20	NP
	17-60	Stratified very gravelly loamy fine sand to cobbly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	5-25	50-65	30-50	10-40	0-20	<10	NP
HdB*: Hinckley---------	0-7	Gravelly loamy sand.	SM, SP-SM, GM, GP-GM	A-1, A-2	0-10	60-85	50-75	25-60	10-35	<20	NP
	7-15	Gravelly loamy sand, loamy fine sand, very gravelly loamy coarse sand.	SM, GM, GP-GM, SP-SM	A-1, A-2, A-3	0-20	50-95	30-85	15-70	2-30	<20	NP
	15-60	Stratified very gravelly loamy fine sand to cobbly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	5-25	50-65	30-50	10-40	0-20	<10	NP
Urban land.											

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HlF*:											
Hollis----------	0-9	Fine sandy loam	SM, ML, GM	A-2, A-4	5-15	65-100	60-95	40-85	20-65	<25	NP-5
	9-18	Gravelly fine sandy loam, fine sandy loam, loam.	SM, ML, GM	A-2, A-4	0-15	65-100	60-95	40-80	20-65	<25	NP-5
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
HoC*, HoD*, HoF*:											
Holyoke---------	0-4	Silt loam--------	ML, SM, CL-ML	A-2, A-4	5-15	75-100	60-95	45-85	25-75	<25	NP-5
	4-16	Gravelly silt loam, loam, fine sandy loam.	ML, SM, CL-ML	A-2, A-4	0-15	75-100	65-95	45-85	25-75	<25	NP-5
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
HuC*:											
Holyoke---------	0-4	Silt loam--------	SM, ML, CL-ML	A-2, A-4	0-5	95-100	75-95	55-90	30-75	<25	NP-5
	4-16	Gravelly silt loam, loam, fine sandy loam.	SM, ML, CL-ML	A-2, A-4	0-15	75-100	65-95	45-85	25-75	<25	NP-5
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
Rock outcrop.											
Ip--------------- Ipswich	0-12	Hemic material---	PT	A-8	0	---	---	---	---	---	NP
	12-40	Hemic material---	PT	A-8	0	---	---	---	---	---	NP
	40-60	Sapric material, hemic material.	PT	A-8	0	---	---	---	---	---	NP
Pa--------------- Palms	0-32	Sapric material	PT	---	---	---	---	---	---	---	---
	32-62	Clay loam, silty clay loam, very fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
PnB, PnC--------- Paxton	0-3	Gravelly fine sandy loam.	SM, ML, SM-SC	A-2, A-4	0-10	80-95	65-90	60-85	30-65	<40	NP-10
	3-29	Fine sandy loam, gravelly loam, gravelly fine sandy loam.	SM, ML, SM-SC	A-2, A-4	0-15	70-90	65-90	50-85	25-65	<30	NP-7
	29-60	Gravelly fine sandy loam, loam, gravelly sandy loam.	SM, ML, SM-SC	A-2, A-4	0-15	70-90	60-85	50-75	20-60	<30	NP-7

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PsC, PsE--------- Paxton	0-3	Gravelly fine sandy loam.	SM, ML, SM-SC	A-2, A-4	5-20	80-95	65-90	60-85	30-65	<40	NP-10
	3-29	Fine sandy loam, gravelly loam, gravelly fine sandy loam.	SM, ML, SM-SC	A-2, A-4	0-15	70-90	65-90	50-85	25-65	<30	NP-7
	29-60	Gravelly fine sandy loam, loam, gravelly sandy loam.	SM, ML, SM-SC	A-2, A-4	0-15	70-90	60-85	50-75	20-60	<30	NP-7
Pt*, Pv*. Pits											
Ra--------------- Rippowam	0-10	Sandy loam-------	SM, ML	A-2, A-4	0	95-100	80-100	55-95	30-75	<25	NP-4
	10-35	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	80-100	55-85	30-50	<20	NP-2
	35-60	Stratified loamy fine sand to very gravelly coarse sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	70-100	45-100	25-75	0-25	---	NP
ReA, ReB, ReC, ReD------------- Riverhead	0-9	Fine sandy loam	SM, ML	A-2, A-4	0-5	95-100	90-100	55-95	30-75	14-18	1-3
	9-24	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, GM	A-2, A-4, A-1	0-5	65-100	60-95	40-80	20-45	14-18	1-3
	24-30	Loamy fine sand, gravelly loamy sand, loamy sand.	SM, SP-SM, GM, GP-GM	A-1, A-2, A-4	0-5	60-90	55-85	30-70	10-45	---	NP
	30-60	Stratified sand and gravel.	SP, SW, SP-SM, GP	A-1	0-10	40-95	35-90	25-50	0-10	---	NP
RuB*, RuC*, RuD*: Riverhead-------	0-9	Fine sandy loam	SM, ML	A-2, A-4	0-5	95-100	90-100	55-95	30-75	14-18	1-3
	9-24	Sandy loam, fine sandy loam, gravelly sandy loam.	SM, GM	A-2, A-4, A-1	0-5	65-100	60-95	40-80	20-45	14-18	1-3
	24-30	Loamy fine sand, gravelly loamy sand, loamy sand.	SM, SP-SM, GM, GP-GM	A-1, A-2, A-4	0-5	60-90	55-85	30-70	10-45	---	NP
	30-60	Stratified sand and gravel.	SP, SW, SP-SM, GP	A-1	0-10	40-95	35-90	25-50	0-10	---	NP
Urban land.											
Sa--------------- Sloan	0-8	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	8-45	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	45-60	Stratified gravelly sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ur*, Us, Uw. Udorthents											
Ux*. Urban land											
Wa--------------- Wallington	0-4	Silt loam--------	ML, CL-ML	A-4	0	100	95-100	90-100	70-90	15-20	3-6
	4-14	Very fine sandy loam, silt loam.	ML, CL-ML	A-4	0	100	95-100	90-100	70-90	15-20	3-6
	14-40	Very fine sandy loam, silt loam.	ML, CL-ML	A-4	0	100	95-100	90-100	70-90	15-20	3-6
	40-60	Very fine sandy loam, loamy very fine sand, silt loam.	ML, SM	A-4	0	95-100	90-100	65-95	40-90	<20	NP-3
Wc--------------- Watchaug	0-5	Fine sandy loam	SM, ML	A-2, A-4	0-10	85-95	70-95	50-85	30-70	<35	NP-10
	5-21	Gravelly fine sandy loam, silt loam, loam.	SM, ML	A-2, A-4	0-15	80-95	65-90	50-80	25-70	<30	NP-6
	21-62	Gravelly sandy loam, gravelly fine sandy loam, fine sandy loam.	SM	A-2, A-4	0-15	70-90	55-90	40-65	20-45	<25	NP-4
	62	Unweathered bedrock.									
WeA, WeB, WeC, WeD------------- Wethersfield	0-13	Gravelly silt loam.	ML, CL-ML, SM	A-4	0-10	65-85	60-75	50-65	40-60	20-40	3-12
	13-22	Gravelly loam, silt loam, fine sandy loam.	ML, CL-ML	A-4	0-15	80-95	75-95	65-85	55-70	20-40	3-12
	22-60	Gravelly loam, loam, gravelly fine sandy loam.	SM, ML	A-4	0-15	75-95	70-90	60-80	40-65	15-40	NP-12
WuB*, WuC*, WuD*: Wethersfield----	0-13	Gravelly silt loam.	ML, CL-ML, SM	A-4	0-10	65-85	60-75	50-65	40-60	20-40	3-12
	13-22	Gravelly loam, silt loam, fine sandy loam.	ML, CL-ML	A-4	0-15	80-95	75-95	65-85	55-70	20-40	3-12
	22-60	Gravelly loam, loam, gravelly fine sandy loam.	SM, ML	A-4	0-15	75-95	70-90	60-80	40-65	15-40	NP-12
Urban land.											
YaB, YaC, YaD---- Yalesville	0-10	Sandy loam-------	SM, ML	A-2, A-4	0-5	85-95	75-95	50-85	30-70	<25	NP-3
	10-27	Fine sandy loam, loam, gravelly loam.	SM, ML, GM	A-2, A-4	0-10	60-95	50-95	35-85	25-70	<25	NP-3
	27-30	Fine sandy loam, gravelly sandy loam, extremely channery loam.	SM, GM, GP-GM	A-1, A-2, A-4	0-20	40-90	25-80	20-65	10-45	---	NP-3
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
YuB*, YuC*, YuD*:											
Yalesville------	0-10	Sandy loam-------	SM, ML	A-2, A-4	0-5	85-95	75-95	50-85	30-70	<25	NP-3
	10-27	Fine sandy loam, loam, gravelly loam.	SM, ML, GM	A-2, A-4	0-10	60-95	50-95	35-85	25-70	<25	NP-3
	27-30	Fine sandy loam, gravelly sandy loam, extremely channery loam.	SM, GM, GP-GM	A-1, A-2, A-4	0-20	40-90	25-80	20-65	10-45	---	NP-3
	30-34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Aa	0-26	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8	---	---	2	55-75
Adrian	26-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low	---		
Ad	0-9	15-27	1.10-1.40	0.6-2.0	0.16-0.22	5.1-7.3	Low	0.37	5	4-10
Alden	9-33	18-35	1.20-1.50	0.2-0.6	0.14-0.20	5.6-7.3	Low	0.37		
	33-60	18-35	1.50-1.80	0.06-0.6	0.08-0.15	6.1-8.4	Low	0.28		
Ca	0-80	---	0.13-0.23	0.2-6.0	0.35-0.45	4.5-7.3	---	---	2	>70
Carlisle										
CeB, CeC, CeD	0-5	3-8	1.00-1.25	0.6-6.0	0.08-0.23	4.5-6.0	Low	0.24	3	2-5
Charlton	5-38	3-8	1.40-1.65	0.6-6.0	0.07-0.20	4.5-6.0	Low	0.24		
	38-60	1-8	1.45-1.70	0.6-6.0	0.05-0.16	4.5-6.0	Low	0.24		
ChC, ChE, ChF	0-5	3-8	1.00-1.25	0.6-6.0	0.08-0.23	4.5-6.0	Low	0.20	3	---
Charlton	5-38	3-8	1.40-1.65	0.6-6.0	0.07-0.20	4.5-6.0	Low	0.24		
	38-60	1-8	1.45-1.70	0.6-6.0	0.05-0.16	4.5-6.0	Low	0.24		
CkC*, CkD*:										
Charlton	0-5	3-8	1.00-1.25	0.6-6.0	0.08-0.23	4.5-6.0	Low	0.20	3	---
	5-38	3-8	1.40-1.65	0.6-6.0	0.07-0.20	4.5-6.0	Low	0.24		
	38-60	1-8	1.45-1.70	0.6-6.0	0.05-0.16	4.5-6.0	Low	0.24		
Rock outcrop.										
CmB*, CmD*:										
Charlton	0-5	3-8	1.00-1.25	0.6-6.0	0.08-0.23	4.5-6.0	Low	0.24	3	2-5
	5-38	3-8	1.40-1.65	0.6-6.0	0.07-0.20	4.5-6.0	Low	0.24		
	38-60	1-8	1.45-1.70	0.6-6.0	0.05-0.16	4.5-6.0	Low	0.24		
Urban land.										
CoC*, CoD*:										
Chatfield	0-9	7-18	1.10-1.40	0.6-6.0	0.08-0.14	4.5-6.0	Low	0.20	3	---
	9-25	7-18	1.20-1.50	0.6-6.0	0.08-0.18	4.5-6.0	Low	0.20		
	25-29	---	---	---	---	---	---	---		
Rock outcrop.										
CrB, CrC	0-10	4-15	1.00-1.25	0.6-6.0	0.10-0.18	4.5-6.0	Low	0.24	3	2-5
Cheshire	10-22	4-15	1.40-1.65	0.6-6.0	0.08-0.21	4.5-6.0	Low	0.37		
	22-60	2-15	1.45-1.70	0.6-6.0	0.05-0.15	4.5-6.0	Low	0.24		
CuB*, CuC*:										
Cheshire	0-10	4-15	1.00-1.25	0.6-6.0	0.10-0.18	4.5-6.0	Low	0.24	3	2-5
	10-22	4-15	1.40-1.65	0.6-6.0	0.08-0.21	4.5-6.0	Low	0.37		
	22-60	2-15	1.45-1.70	0.6-6.0	0.05-0.15	4.5-6.0	Low	0.24		
Urban land.										
Fh*:										
Fluvaquents.										
Medisaprists.										

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
Fr Fredon	0-10	7-20	1.20-1.40	0.6-2.0	0.12-0.20	5.6-7.3	Low	0.28	3	3-5
	10-25	7-20	1.20-1.40	0.2-2.0	0.12-0.20	5.6-7.3	Low	0.24		
	25-60	2-10	1.30-1.50	6.0-20	0.02-0.06	5.6-8.4	Low	0.10		
HaA, HaB Haven	0-5	5-18	1.10-1.40	0.6-2.0	0.15-0.25	4.5-6.0	Low	0.32	3	2-6
	5-28	2-18	1.25-1.55	0.6-2.0	0.08-0.12	4.5-6.0	Low	0.24		
	28-60	0-3	1.45-1.65	>20	0.01-0.03	4.5-6.0	Low	0.17		
HbB*:										
Haven	0-5	5-18	1.10-1.40	0.6-2.0	0.15-0.25	4.5-6.0	Low	0.32	3	2-6
	5-28	2-18	1.25-1.55	0.6-2.0	0.08-0.12	4.5-6.0	Low	0.24		
	28-60	0-3	1.45-1.65	>20	0.01-0.03	4.5-6.0	Low	0.17		
Urban land.										
HcA, HcB, HcC, HcD Hinckley	0-4	4-8	1.00-1.20	6.0-20	0.06-0.12	3.6-6.0	Low	0.17	3	2-7
	4-17	1-5	1.20-1.40	6.0-20	0.01-0.10	3.6-6.0	Low	0.17		
	17-60	0-3	1.30-1.50	>20	0.01-0.06	3.6-6.0	Low	0.10		
HdB*:										
Hinckley	0-7	4-8	1.00-1.20	6.0-20	0.06-0.12	3.6-6.0	Low	0.17	3	2-7
	7-15	1-5	1.20-1.40	6.0-20	0.01-0.10	3.6-6.0	Low	0.17		
	15-60	0-3	1.30-1.50	>20	0.01-0.06	3.6-6.0	Low	0.10		
Urban land.										
HlF*:										
Hollis	0-9	3-10	1.10-1.40	0.6-6.0	0.10-0.18	4.5-6.0	Low	0.17	1	---
	9-18	1-8	1.30-1.55	0.6-6.0	0.06-0.18	4.5-6.0	Low	0.32		
	18-22	---	---	---	---	---	---	---		
Rock outcrop.										
HoC*, HoD*, HoF*:										
Holyoke	0-4	3-12	1.10-1.25	0.6-2.0	0.18-0.20	3.6-6.0	Low	0.20	1	2-5
	4-16	3-12	1.30-1.55	0.6-2.0	0.11-0.22	3.6-6.0	Low	0.43		
	16-20	---	---	---	---	---	---	---		
Rock outcrop.										
HuC*:										
Holyoke	0-4	3-12	1.10-1.25	0.6-2.0	0.12-0.22	3.6-6.0	Low	0.28	1	2-5
	4-16	3-12	1.30-1.55	0.6-2.0	0.11-0.22	3.6-6.0	Low	0.43		
	16-20	---	---	---	---	---	---	---		
Urban land.										
Rock outcrop.										
Ip Ipswich	0-12	---	0.10-0.30	0.6-20	0.18-0.35	5.1-7.8	---	---	---	---
	12-40	---	0.10-0.30	0.6-20	0.18-0.35	5.1-7.8	---	---		
	40-60	---	0.10-0.30	0.6-20	0.18-0.35	5.1-7.8	---	---		
Pa Palms	0-32	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	---	---	2	>75
	32-62	7-35	1.45-1.75	0.2-2.0	0.14-0.22	6.1-8.4	Low	---		
PnB, PnC Paxton	0-3	3-12	1.00-1.25	0.6-2.0	0.10-0.20	4.5-6.0	Low	0.24	3	2-5
	3-29	3-12	1.35-1.60	0.6-2.0	0.08-0.18	4.5-6.0	Low	0.32		
	29-60	3-12	1.70-2.00	<0.2	0.05-0.12	4.5-6.0	Low	0.24		

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
PsC, PsE--------- Paxton	0-3	3-12	1.00-1.25	0.6-6.0	0.08-0.20	4.5-6.0	Low-----------	0.20	3	---
	3-29	3-12	1.35-1.60	0.6-6.0	0.08-0.18	4.5-6.0	Low-----------	0.32		
	29-60	3-12	1.70-2.00	<0.2	0.05-0.12	4.5-6.0	Low-----------	0.24		
Pt*. Pv*. Pits										
Ra--------------- Rippowam	0-10	2-6	1.10-1.35	0.6-6.0	0.11-0.21	4.5-7.3	Low-----------	0.20	5	3-8
	10-35	1-6	1.20-1.45	0.6-6.0	0.09-0.18	4.5-7.3	Low-----------	0.20		
	35-60	0-2	1.25-1.50	>6.0	0.01-0.10	4.5-7.3	Low-----------	0.17		
ReA, ReB, ReC, ReD-------------- Riverhead	0-9	3-10	1.10-1.40	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.28	3	2-4
	9-24	1-8	1.25-1.55	2.0-6.0	0.09-0.13	4.5-6.0	Low-----------	0.28		
	24-30	1-8	1.25-1.55	2.0-6.0	0.04-0.13	4.5-6.0	Low-----------	0.17		
	30-60	1-8	1.45-1.65	>20	0.02-0.04	4.5-6.5	Low-----------	0.17		
RuB*, RuC*, RuD*: Riverhead-------	0-9	3-10	1.10-1.40	2.0-6.0	0.14-0.20	4.5-6.0	Low-----------	0.28	3	2-4
	9-24	1-8	1.25-1.55	2.0-6.0	0.09-0.13	4.5-6.0	Low-----------	0.28		
	24-30	1-8	1.25-1.55	2.0-6.0	0.04-0.13	4.5-6.0	Low-----------	0.17		
	30-60	1-8	1.45-1.65	>20	0.02-0.04	4.5-6.5	Low-----------	0.17		
Urban land.										
Sa--------------- Sloan	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	3-6
	8-45	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-7.8	Moderate-----	0.37		
	45-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.1-7.8	Low-----------	0.37		
Ur*, Us, Uw. Udorthents										
Ux*. Urban land										
Wa--------------- Wallington	0-4	5-18	1.20-1.50	0.6-2.0	0.19-0.21	4.5-7.3	Low-----------	0.49	3	2-6
	4-14	5-18	1.20-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Low-----------	0.64		
	14-40	5-18	1.50-1.80	0.06-0.2	0.10-0.14	5.1-6.5	Low-----------	0.64		
	40-60	2-18	1.45-1.65	0.06-0.2	0.10-0.14	5.6-6.5	Low-----------	0.64		
Wc--------------- Watchaug	0-5	4-15	1.00-1.25	0.6-2.0	0.11-0.24	4.5-6.0	Low-----------	0.28	3	2-7
	5-21	4-15	1.40-1.65	0.6-2.0	0.08-0.21	4.5-6.0	Low-----------	0.37		
	21-62	2-15	1.45-1.70	0.6-6.0	0.05-0.15	4.5-6.5	Low-----------	0.24		
WeA, WeB, WeC, WeD------------- Wethersfield	0-13	5-15	1.10-1.30	0.6-2.0	0.11-0.18	4.5-7.3	Low-----------	0.24	3	2-5
	13-22	5-15	1.20-1.50	0.6-2.0	0.12-0.20	4.5-6.5	Low-----------	0.32		
	22-60	5-15	1.70-2.00	<0.2	0.05-0.12	4.5-6.0	Low-----------	0.24		
WuB*, WuC*, WuD*: Wethersfield----	0-13	5-15	1.10-1.30	0.6-2.0	0.11-0.18	4.5-7.3	Low-----------	0.24	3	2-5
	13-22	5-15	1.20-1.50	0.6-2.0	0.12-0.20	4.5-6.5	Low-----------	0.32		
	22-60	5-15	1.70-2.00	<0.2	0.05-0.12	4.5-6.0	Low-----------	0.24		
Urban land.										

See footnote at end of table.

TABLE 18.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
YaB, YaC, YaD---- Yalesville	0-10	3-15	1.10-1.30	0.6-6.0	0.12-0.22	4.5-6.0	Low----------	0.28	3	2-5
	10-27	3-15	1.35-1.60	0.6-6.0	0.08-0.20	4.5-6.0	Low----------	0.32		
	27-30	1-15	1.35-1.60	2.0-6.0	0.05-0.15	4.5-6.0	Low----------	0.24		
	30-34	---	---	---	---	---	-------------	----		
YuB*, YuC*, YuD*:										
Yalesville------	0-10	3-15	1.10-1.30	0.6-6.0	0.12-0.22	4.5-6.0	Low----------	0.28	3	2-5
	10-27	3-15	1.35-1.60	0.6-6.0	0.08-0.20	4.5-6.0	Low----------	0.32		
	27-30	1-15	1.35-1.60	2.0-6.0	0.05-0.15	4.5-6.0	Low----------	0.24		
	30-34	---	---	---	---	---	-------------	----		
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "occasional," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Aa Adrian	A/D	None	---	---	+1-1.0	Apparent	Nov-May	>60	---	High	High	Moderate.
Ad Alden	D	None	---	---	+1-0.5	Apparent	Nov-Jun	>60	---	High	High	Low.
Ca Carlisle	A/D	None	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
CeB, CeC, CeD, ChC, ChE, ChF Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
CkC*, CkD*: Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Rock outcrop.												
CmB*, CmD*: Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Urban land.												
CoC*, CoD*: Chatfield	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low	Moderate.
Rock outcrop.												
CrB, CrC Cheshire	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
CuB*, CuC*: Cheshire	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Urban land.												
Fh*: Fluvaquents.												
Medisaprists.												

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Fr---------------- Fredon	C	Occasional	Brief-----	Jan-Apr	0-1.5	Apparent	Oct-Jun	>60	---	High-----	Low------	Low.
HaA, HaB---------- Haven	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
HbB*: Haven--------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Urban land.												
HcA, HcB, HcC, HcD-------------- Hinckley	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
HdB*: Hinckley----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Urban land.												
HlF*: Hollis------------	C/D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
Rock outcrop.												
HoC*, HoD*, HoF*: Holyoke----------	C/D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
Rock outcrop.												
HuC*: Holyoke----------	C/D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low------	High.
Urban land.												
Rock outcrop.												
Ip---------------- Ipswich	D	Frequent----	Very brief	Jan-Dec	+1-0	Apparent	Jan-Dec	>60	---	---	High-----	High.
Pa---------------- Palms	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
PnB, PnC, PsC, PsE-------------- Paxton	C	None--------	---	---	1.5-2.5	Perched	Feb-Apr	>60	---	Moderate	Low------	Moderate.

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Pt*, Pv*. Pits												
Ra---------------- Rippowam	C	Frequent----	Brief-----	Oct-May	0-1.5	Apparent	Sep-Jun	>60	---	High-----	High-----	High.
ReA, ReB, ReC, ReD-------------- Riverhead	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
RuB*, RuC*, RuD*: Riverhead--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Urban land.												
Sa---------------- Sloan	B/D	Occasional	Brief-----	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Ur*, Us, Uw. Udorthents												
Ux*. Urban land												
Wa---------------- Wallington	C	None--------	---	---	0.5-1.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
Wc---------------- Watchaug	B	None--------	---	---	1.5-2.5	Apparent	Nov-Apr	>60	---	High-----	Low------	High.
WeA, WeB, WeC, WeD-------------- Wethersfield	C	None--------	---	---	1.5-2.5	Perched	Feb-Apr	>60	---	Moderate	Low------	Moderate.
WuB*, WuC*, WuD*: Wethersfield-----	C	None--------	---	---	1.5-2.5	Perched	Feb-Apr	>60	---	Moderate	Low------	Moderate.
Urban land.												
YaB, YaC, YaD----- Yalesville	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	Moderate.
YuB*, YuC*, YuD*: Yalesville-------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	Moderate.
Urban land.												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Alden	Fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts
Carlisle	Euic, mesic Typic Medisaprists
Charlton	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Chatfield	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Cheshire	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Fluvaquents	Fluvaquents
Fredon	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic Aeric Haplaquepts
Haven	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Dystrochrepts
Hinckley	Sandy-skeletal, mixed, mesic Typic Udorthents
Hollis	Loamy, mixed, mesic Lithic Dystrochrepts
Holyoke	Loamy, mixed, mesic Lithic Dystrochrepts
Ipswich	Euic, mesic Typic Sulfihemists
Medisaprists	Medisaprists
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Paxton	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Rippowam	Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Riverhead	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Udorthents	Udorthents
Wallington	Coarse-silty, mixed, mesic Aeric Fragiaquepts
Watchaug	Coarse-loamy, mixed, mesic Aquic Dystrochrepts
Wethersfield	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Yalesville	Coarse-loamy, mixed, mesic Typic Dystrochrepts

TABLE 21.--RELATIONSHIP BETWEEN SOIL CHARACTERISTICS AND PARENT MATERIAL, LANDSCAPE POSITION, AND DRAINAGE

Soil characteristics and parent material	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
	SOILS ON UPLAND TILL PLAINS					
Very deep, medium textured soils; formed in yellowish brown glacial till; with a dense substratum		Paxton				
Very deep, medium textured soils; formed in reddish brown glacial till; with a dense substratum		Wethersfield				
Very deep, medium textured soils; formed in colluvium over medium textured, dense glacial till						Alden
Moderately deep, medium and moderately coarse textured soils; formed in yellowish brown glacial till over acid crystalline bedrock at depths of 20 to 40 inches	Chatfield	Chatfield				
Moderately deep, medium textured soils; formed in reddish brown glacial till over Triassic sandstone, conglomerate, or shale at depths of 20 to 40 inches		Yalesville				
Shallow, moderately coarse textured soils; formed in yellowish brown glacial till over granite, gneiss, and schist at depths of 10 to 20 inches	Hollis	Hollis				
Shallow, medium textured soils; formed in reddish brown glacial till over sandstone, conglomerate, or shale at depths of 10 to 20 inches	Holyoke	Holyoke				
Very deep, moderately coarse textured soils; formed in reddish brown glacial till		Cheshire	Watchaug			
Very deep, moderately coarse and medium textured soils; formed in yellowish brown glacial till		Charlton				

TABLE 21.--RELATIONSHIP BETWEEN SOIL CHARACTERISTICS AND PARENT MATERIAL, LANDSCAPE POSITION, AND DRAINAGE--Continued

Soil characteristics and parent material	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
SOILS ON UPLAND TILL PLAINS						
Very deep, fine textured soils; formed in dark colored lacustrine material over medium textured till; with a fragipan			Wallington			
SOILS ON OUTWASH PLAINS AND TERRACES						
Very deep soils; formed in moderately coarse and medium textured sediment over sandy and gravelly outwash		Riverhead Haven		Fredon	Fredon	
Very deep, coarse textured soils; formed in outwash sands and gravels	Hinckley					
SOILS IN SWAMPS AND BOGS						
Very deep soils; formed in well decomposed organic matter; subject to daily tidal inundation						Ipswich
Very deep soils; formed in 16 to 51 inches of well decomposed organic matter over loamy sediments						Palms
Very deep soils; formed in 16 to 51 inches of well decomposed organic matter over sandy deposits						Adrian
Very deep soils; formed in more than 51 inches of well decomposed organic matter						Carlisle

TABLE 21.--RELATIONSHIP BETWEEN SOIL CHARACTERISTICS AND PARENT MATERIAL, LANDSCAPE POSITION, AND DRAINAGE--Continued

Soil characteristics and parent material	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
SOILS ON FLOODPLAINS						
Very deep soils; formed in coarse textured dark colored alluvial sediments					Rippowam	
Very deep soils; formed in moderately fine textured grayish brown alluvial sediments						Sloan
Very deep soils; formed in moderately fine to coarse textured alluvial sediments				Fluvaquents	Fluvaquents	Fluvaquents
Very deep soils; formed in well decomposed organic matter						Medisaprists

U.S. GOVERNMENT PRINTING OFFICE: 1990-262-945/20038

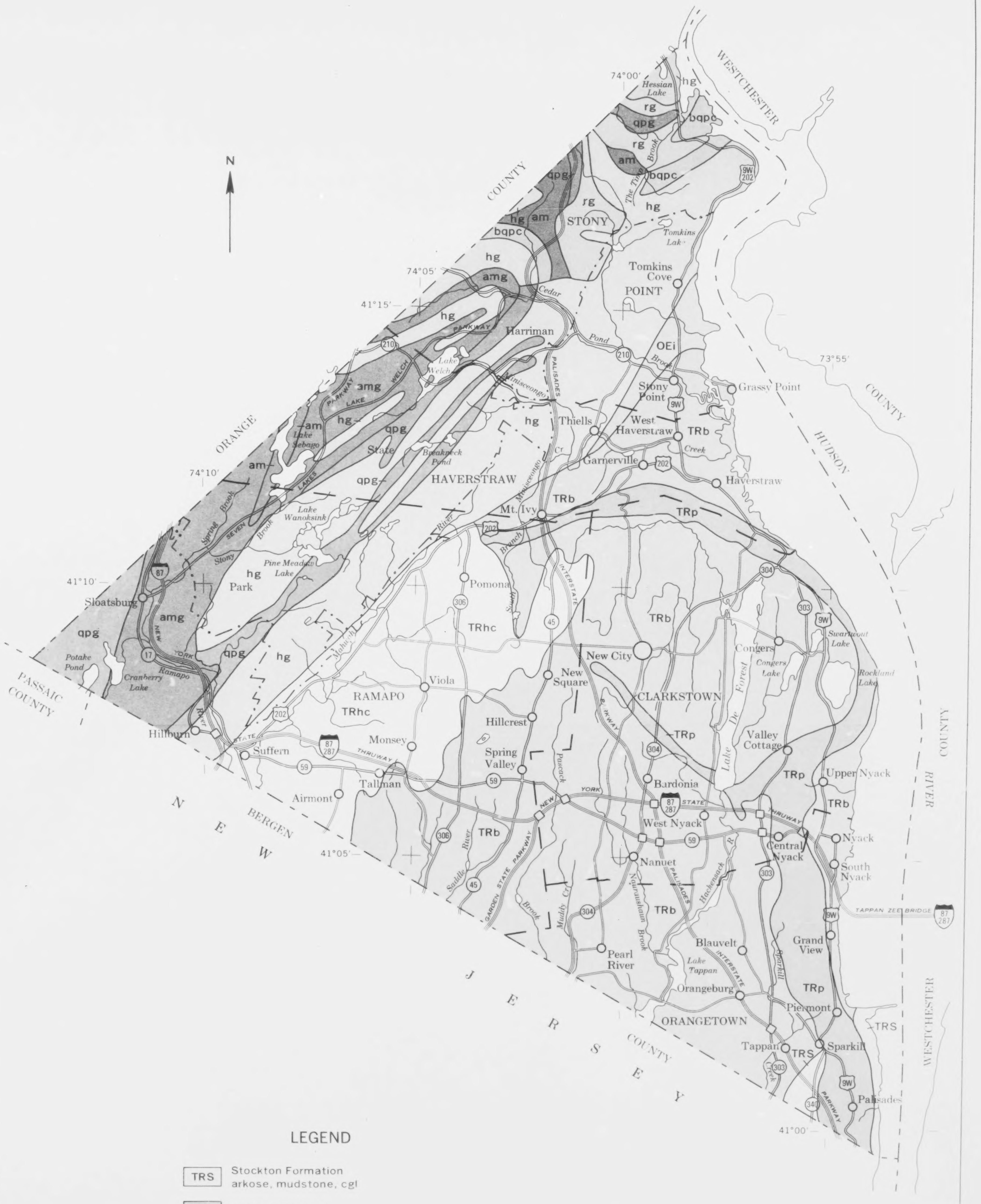
MAPS

TRANSPOSED TO

END OF VOLUME

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE


N
74°00'
74°05'
74°10'
41°15'
41°10'
41°05'
41°00'
73°55'
ORANGE COUNTY
PASSAIC COUNTY
BERGEN COUNTY
NEW JERSEY
WESTCHESTER COUNTY
HUDSON RIVER
STONY POINT
HAVERSTRAW
RAMAPO
CLARKSTOWN
ORANGETOWN
Hessian Lake
Tomkins Lake
Tomkins Cove
Harriman
Thiells
Stony Point
Grassy Point
West Haverstraw
Garnerville
Haverstraw
Mt. Ivy
Pomona
New City
Congers
New Square
Viola
Hillcrest
Spring Valley
Monsey
Suffern
Hillburn
Sloatsburg
Tallman
Airmont
Bardonia
Valley Cottage
Upper Nyack
West Nyack
Nanuet
Central Nyack
Nyack
South Nyack
Pearl River
Blauvelt
Grand View
Orangeburg
Piermont
Tappan
Sparkill
Palisades
Lake Welch
Lake Sebago
Lake Wanoksink
Pine Meadow Lake
Breakneck Pond
Potake Pond
Cranberry Lake
Congers Lake
Rockland Lake
Swartout Lake
Lake Tappan
Lake De Forest
Park
State
TAPPAN ZEE BRIDGE
PALISADES INTERSTATE PARKWAY
GARDEN STATE PARKWAY
NEW YORK STATE THRUWAY
qpg
rg
hg
bqpc
am
amg
OEi
TRb
TRp
TRhc
TRS

LEGEND

TRS	Stockton Formation arkose, mudstone, cgl
TRp	Palisade Diabase
TRb	Brunswick Formation arkose, mudstone, cgl, Ss, Slst
TRhc	Hammer Creek Formation cgl
qpg	Quartz plagioclase gneiss with associated minerals
amg	Interlayered Amphibolite and hornblende granitic gneiss
am	Amphibolite, hornblende gneiss
bqpc	Biotite-quartz-plagioclase gneiss
OEi	Inwood Marble
hg	Hornblende granite and granitic gneiss
rg	Biotite-quartz-feldspar gneiss

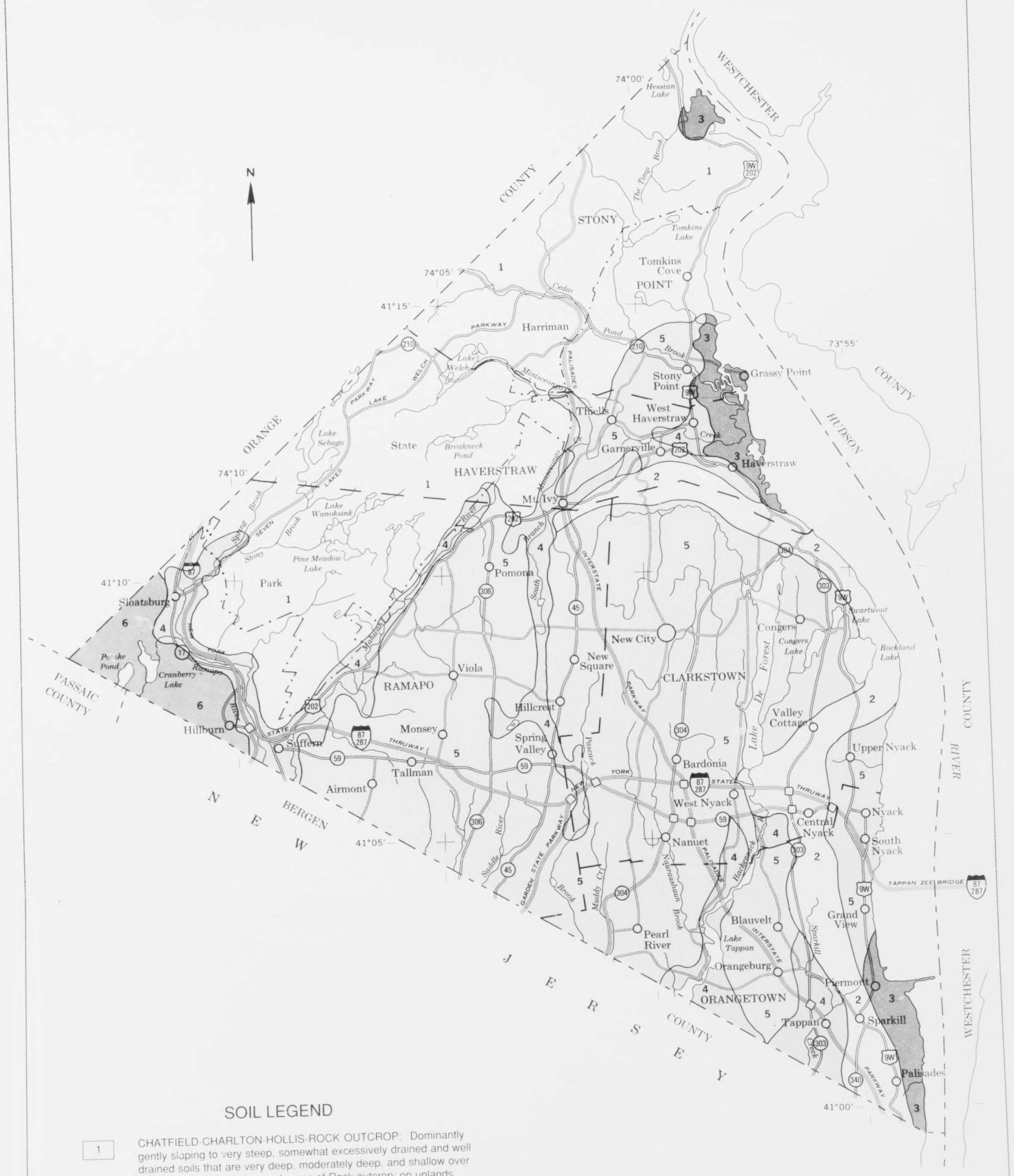
GENERAL GEOLOGY MAP
ROCKLAND COUNTY, NEW YORK

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 3 6 Km

best copy available


N
74°00'
Hessian Lake
WESTCHESTER
COUNTY
STONY
POINT
Tomkins Lake
Tomkins Cove
74°05'
41°15'
Harriman
Cedar Pond Brook
Lake Welch
Stony Point
Grassy Point
73°55'
HUDSON
COUNTY
West Haverstraw
Thiells
Garnerville
Haverstraw
ORANGE
Lake Sebago
State
Breakneck Pond
HAVERSTRAW
74°10'
Lake Wanoksink
Mt. Ivy
Pine Meadow Lake
Pomona
41°10'
Park
Sloatsburg
New City
Congers
Swartout Lake
Congers Lake
Rockland Lake
Potake Pond
Cranberry Lake
PASSAIC
COUNTY
New Square
Viola
RAMAPO
CLARKSTOWN
Lake De Forest
Hillcrest
Valley Cottage
Hillburn
Suffern
Monsey
Spring Valley
Upper Nyack
Tallman
Airmont
Bardonia
West Nyack
NEW YORK STATE THRUWAY
RIVER
Nyack
Central Nyack
South Nyack
NEW
BERGEN
41°05'
Nanuet
TAPPAN ZEE BRIDGE
Pearl River
Blauvelt
Grand View
Lake Tappan
Orangeburg
Piermont
ORANGETOWN
Sparkill
Tappan
Palisades
41°00'
JERSEY
COUNTY
WESTCHESTER
1
2
3
4
5
6

SOIL LEGEND

1 CHATFIELD-CHARLTON-HOLLIS-ROCK OUTCROP: Dominantly gently sloping to very steep, somewhat excessively drained and well drained soils that are very deep, moderately deep, and shallow over schist, granite, or gneiss; and areas of Rock outcrop; on uplands

2 HOLYOKE-WETHERSFIELD-ROCK OUTCROP: Dominantly rolling to very steep, somewhat excessively drained and well drained soils that are shallow and very deep over basalt, red sandstone, or shale; and areas of Rock outcrop; on uplands

3 UDORTHENTS-IPSWICH: Nearly level and gently sloping, somewhat excessively drained to moderately well drained and very poorly drained soils formed in mixed material or organic material; along the Hudson River

4 RIVERHEAD-HINCKLEY-CARLISLE: Very deep, nearly level to moderately steep, excessively drained to well drained soils on outwash plains and terraces; very deep, nearly level, very poorly drained soils in bogs and depressions

5 WETHERSFIELD-CHESHIRE-URBAN LAND: Very deep, nearly level to moderately steep, well drained soils formed in acid glacial till derived from reddish sandstone on till plains; areas of Urban land

6 PAXTON-CHATFIELD-ROCK OUTCROP: Dominantly gently sloping to steep, somewhat excessively drained and well drained soils that are very deep and moderately deep over schist, gneiss, or granite; areas of Rock outcrop; on uplands

Compiled 1989

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

ROCKLAND COUNTY, NEW YORK

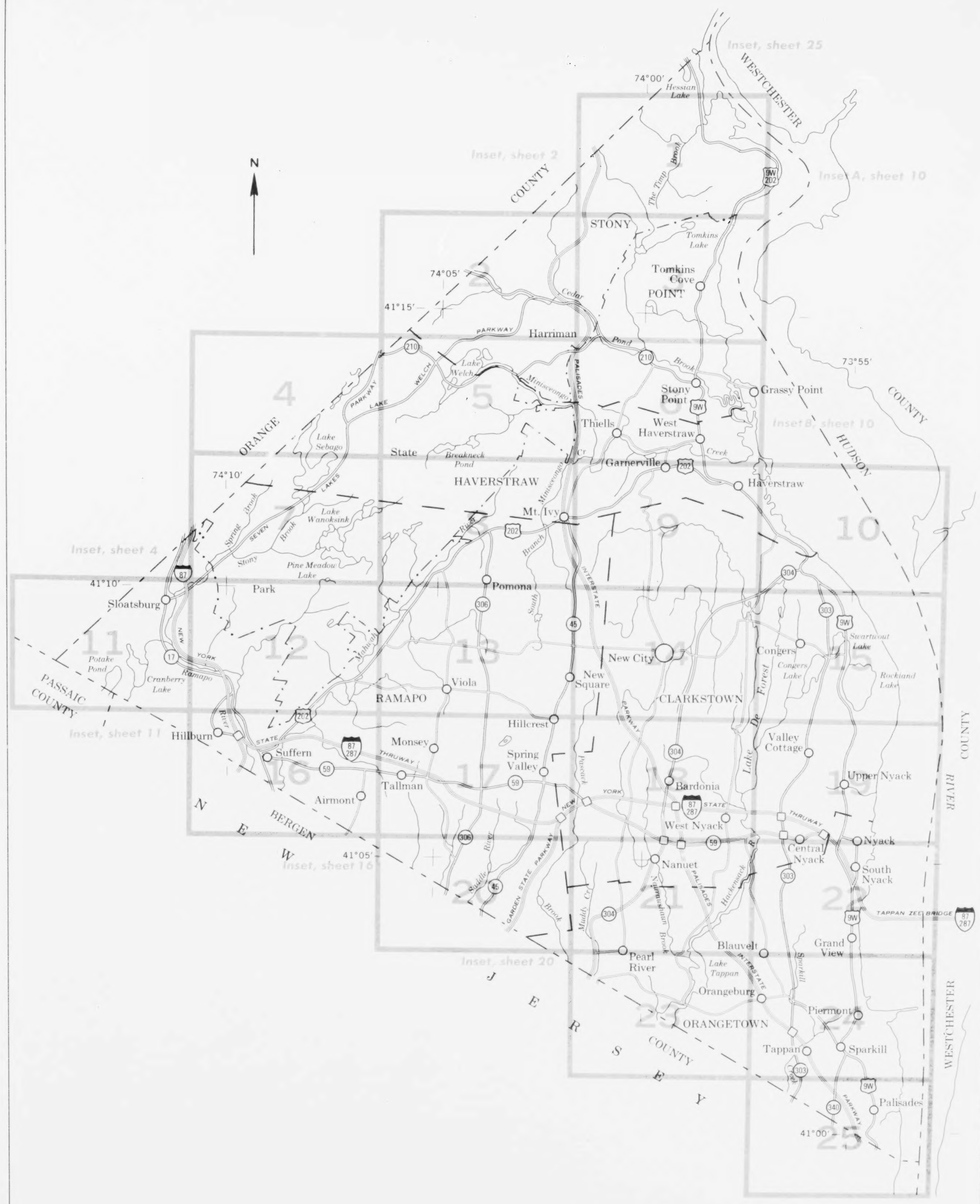
Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

for decisions on the use of specific tracts.


N
Inset, sheet 25
WESTCHESTER
74°00'
Hessian Lake
Inset, sheet 2
COUNTY
Inset A, sheet 10
STONY
Tomkins Lake
Tomkins Cove
POINT
74°05'
41°15'
Harriman
PARKWAY
Cedar
Pond
Brook
73°55'
4
5
Lake Welch
Stony Point
Grassy Point
ORANGE
Thiells
West Haverstraw
Inset B, sheet 10
COUNTY
HUDSON
Lake Sebago
State
Breakneck Pond
Garnerville
Creek
Haverstraw
74°10'
HAVERSTRAW
Lake Wanoksink
Mt. Ivy
9
10
Inset, sheet 4
Pine Meadow Lake
Park
Pomona
41°10'
Sloatsburg
11
12
13
New City
Congers
Swartout Lake
Potake Pond
Cranberry Lake
Viola
New Square
Congers Lake
Rockland Lake
PASSAIC COUNTY
RAMAPO
CLARKSTOWN
Inset, sheet 11
Hillburn
Hillcrest
Valley Cottage
COUNTY
Suffern
Monsey
Spring Valley
Upper Nyack
16
17
Tallman
Bardonia
RIVER
Airmont
West Nyack
N
E
W
BERGEN
Nyack
41°05'
Central Nyack
South Nyack
Inset, sheet 15
Nanuet
21
22
TAPPAN ZEE BRIDGE
Grand View
Blauvelt
Inset, sheet 20
Pearl River
Lake Tappan
J
E
R
S
E
Y
Orangeburg
Piermont
WESTCHESTER
ORANGETOWN
COUNTY
Tappan
Sparkill
Palisades
41°00'
25

INDEX TO MAP SHEETS

ROCKLAND COUNTY, NEW YORK

Scale 1:126,720

1 0 1 2 3 4 Miles
1 0 3 6 Km

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ROCKLAND COUNTY, NEW YORK

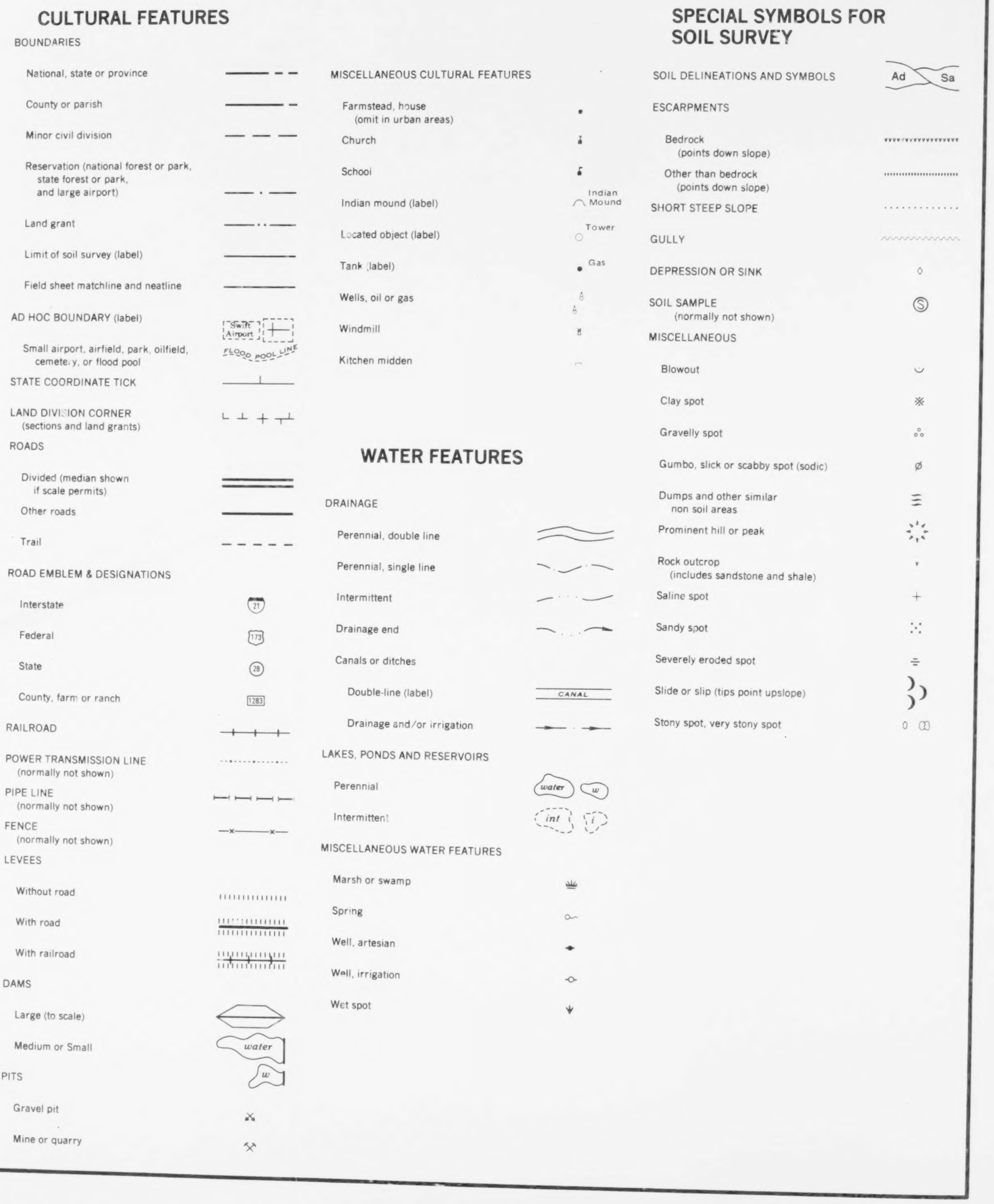
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
Aa	Adrian muck
Ad	Alden silt loam
Ca	Carlisle muck
CeB	Charlton fine sandy loam, 2 to 8 percent slopes
CeC	Charlton fine sandy loam, 8 to 15 percent slopes
CeD	Charlton fine sandy loam, 15 to 25 percent slopes
ChC	Charlton fine sandy loam, 2 to 15 percent slopes, very stony
ChE	Charlton fine sandy loam, 15 to 35 percent slopes, very stony
ChF	Charlton fine sandy loam, 35 to 50 percent slopes, very stony
CkC	Charlton-Rock outcrop complex, rolling
CkD	Charlton-Rock outcrop complex, hilly
CmB	Charlton-Urban land complex, 2 to 8 percent slopes
CmD	Charlton-Urban land complex, 15 to 25 percent slopes
CoC	Chatfield-Rock outcrop complex, rolling
CoD	Chatfield-Rock outcrop complex, hilly
CrB	Cheshire gravelly fine sandy loam, 2 to 8 percent slopes
CrC	Cheshire gravelly fine sandy loam, 8 to 15 percent slopes
CuB	Cheshire-Urban land complex, 2 to 8 percent slopes
CuC	Cheshire-Urban land complex, 8 to 15 percent slopes
Fh	Fluvaquents and Medisaprists, ponded
Fr	Fredon loam
HaA	Haven loam, 0 to 3 percent slopes
HaB	Haven loam, 3 to 8 percent slopes
HbB	Haven-Urban land complex, 0 to 8 percent slopes
HcA	Hinckley gravelly loamy sand, 0 to 3 percent slopes
HcB	Hinckley gravelly loamy sand, 3 to 8 percent slopes
HcC	Hinckley gravelly loamy sand, 8 to 15 percent slopes
HcD	Hinckley gravelly loamy sand, 15 to 25 percent slopes
HdB	Hinckley-Urban land complex, 0 to 8 percent slopes
HlF	Hollis-Rock outcrop complex, very steep
HoC	Holyoke-Rock outcrop complex, rolling
HoD	Holyoke-Rock outcrop complex, hilly
HoF	Holyoke-Rock outcrop complex, very steep
HuC	Holyoke-Urban land-Rock outcrop complex, rolling
Ip	Ipswich mucky peat
Pa	Palms muck
PnB	Paxton gravelly fine sandy loam, 2 to 8 percent slopes
PnC	Paxton gravelly fine sandy loam, 8 to 15 percent slopes
PsC	Paxton gravelly fine sandy loam, 2 to 15 percent slopes, very stony
PsE	Paxton gravelly fine sandy loam, 15 to 35 percent slopes, very stony
Pt	Pits, gravel
Pv	Pits, quarry
Ra	Rippowam sandy loam
ReA	Riverhead fine sandy loam, 0 to 3 percent slopes
ReB	Riverhead fine sandy loam, 3 to 8 percent slopes
ReC	Riverhead fine sandy loam, 8 to 15 percent slopes
ReD	Riverhead fine sandy loam, 15 to 25 percent slopes
RuB	Riverhead-Urban land complex, 0 to 8 percent slopes
RuC	Riverhead-Urban land complex, 8 to 15 percent slopes
RuD	Riverhead-Urban land complex, 15 to 25 percent slopes
Sa	Sloan silt loam
Ur	Udorthents, refuse substratum
Us	Udorthents, smoothed
Uw	Udorthents, wet substratum
Ux	Urban land
Wa	Wallington silt loam
Wc	Watchaug fine sandy loam
WeA	Wethersfield gravelly silt loam, 0 to 3 percent slopes
WeB	Wethersfield gravelly silt loam, 3 to 8 percent slopes
WeC	Wethersfield gravelly silt loam, 8 to 15 percent slopes.
WeD	Wethersfield gravelly silt loam, 15 to 25 percent slopes
WuB	Wethersfield-Urban land complex, 2 to 8 percent slopes
WuC	Wethersfield-Urban land complex, 8 to 15 percent slopes
WuD	Wethersfield-Urban land complex, 15 to 25 percent slopes
YaB	Yalesville sandy loam, 2 to 8 percent slopes
YaC	Yalesville sandy loam, 8 to 15 percent slopes
YaD	Yalesville sandy loam, 15 to 25 percent slopes
YuB	Yalesville-Urban land complex, 2 to 8 percent slopes
YuC	Yalesville-Urban land complex, 8 to 15 percent slopes
YuD	Yalesville-Urban land complex, 15 to 25 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND



CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

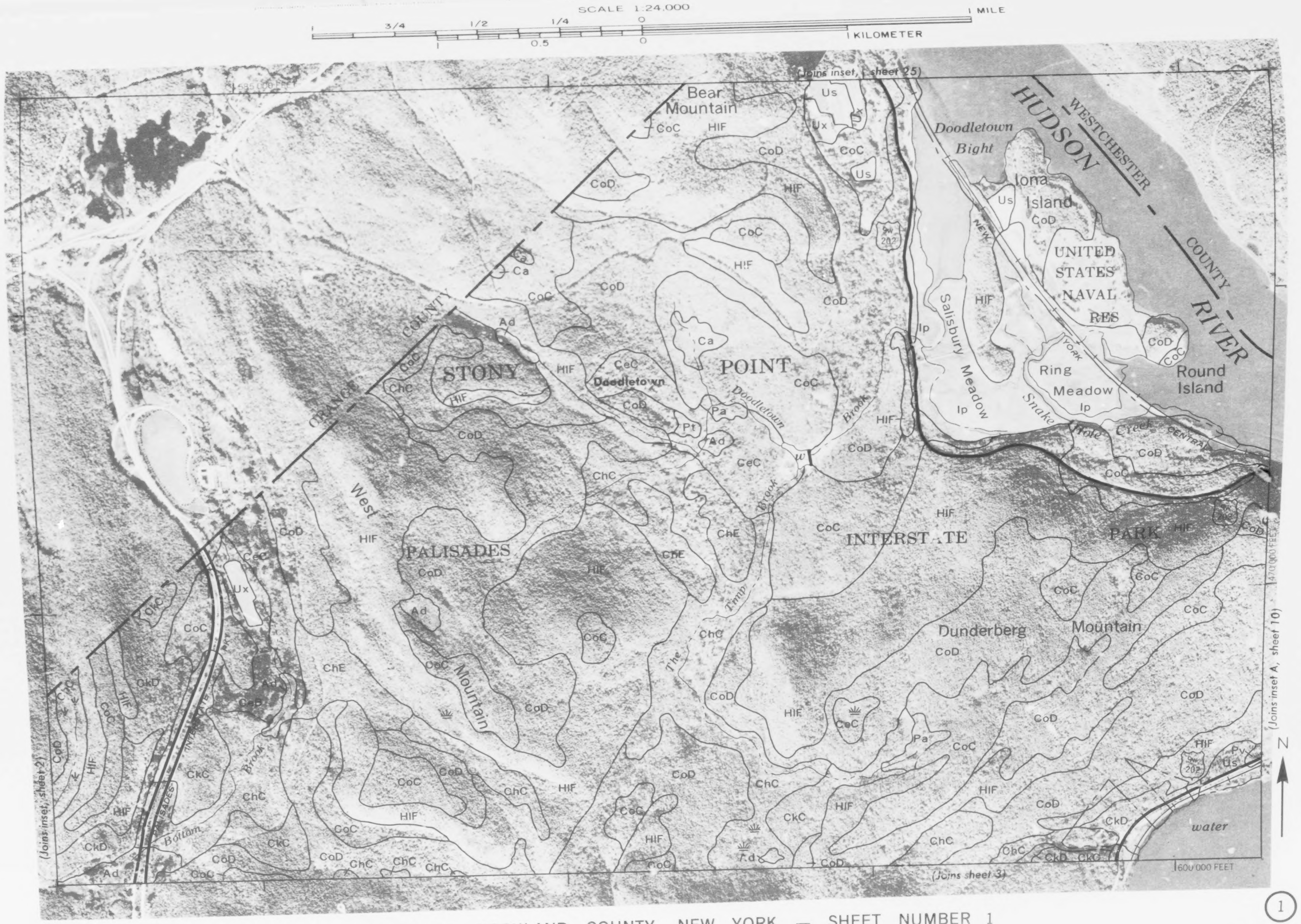
GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

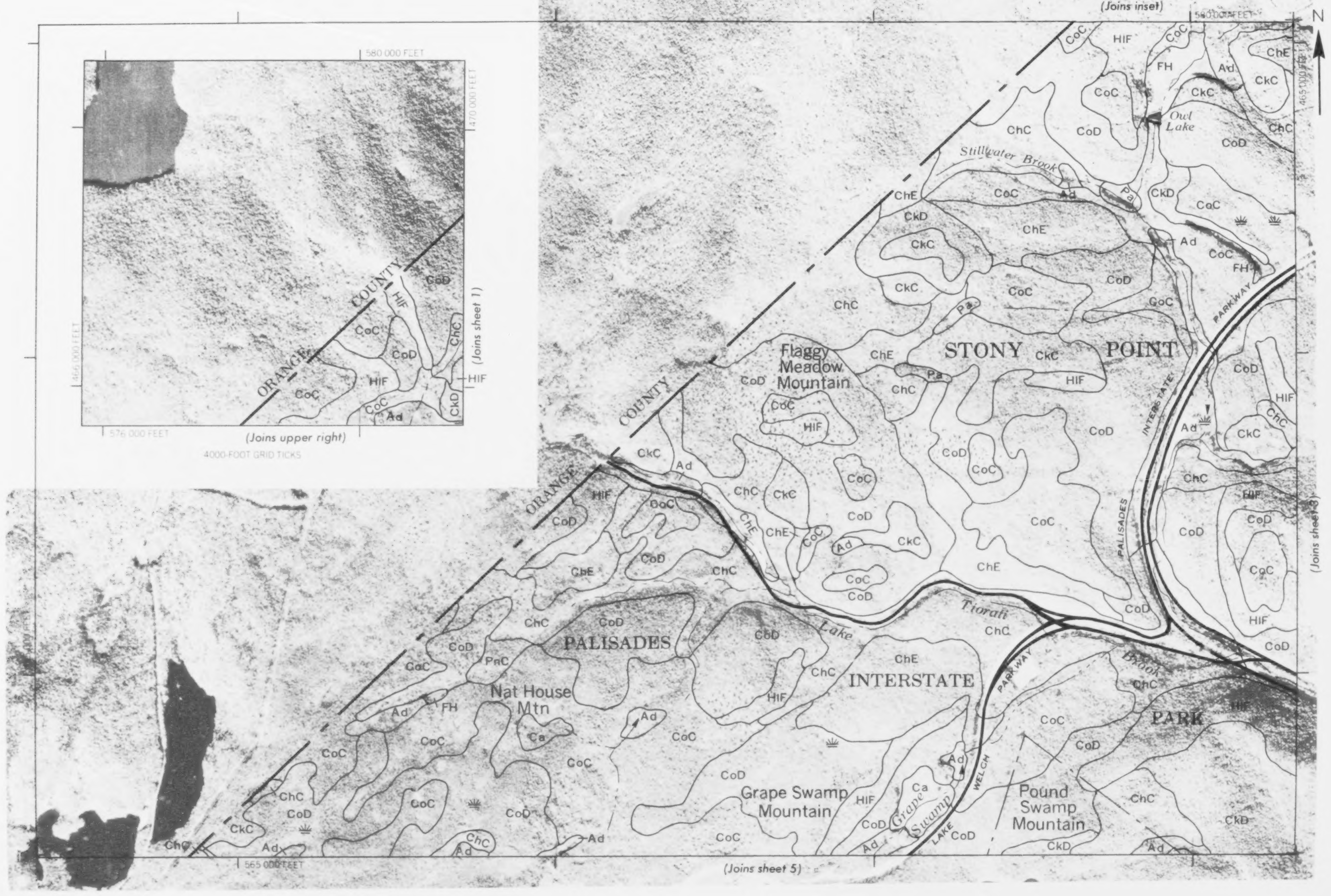
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot


SCALE 1:24,000
1 MILE
1 KILOMETER
Bear Mountain
Doodletown Bight
HUDSON RIVER
WESTCHESTER COUNTY
Iona Island
UNITED STATES NAVAL RES
Salisbury Meadow
Ring Meadow
Snake Hole Creek
Round Island
STONY POINT
Doodletown
Doodletown Brook
ORANGE COUNTY
West Mountain
PALISADES INTERSTATE PARK
Dunderberg Mountain
Timp Brook
Bottom Brook
water
(Joins inset, sheet 25)
(Joins sheet 3)
(Joins inset, sheet 2)
(Joins inset A, sheet 10)
N
600 000 FEET

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 1

①

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 2

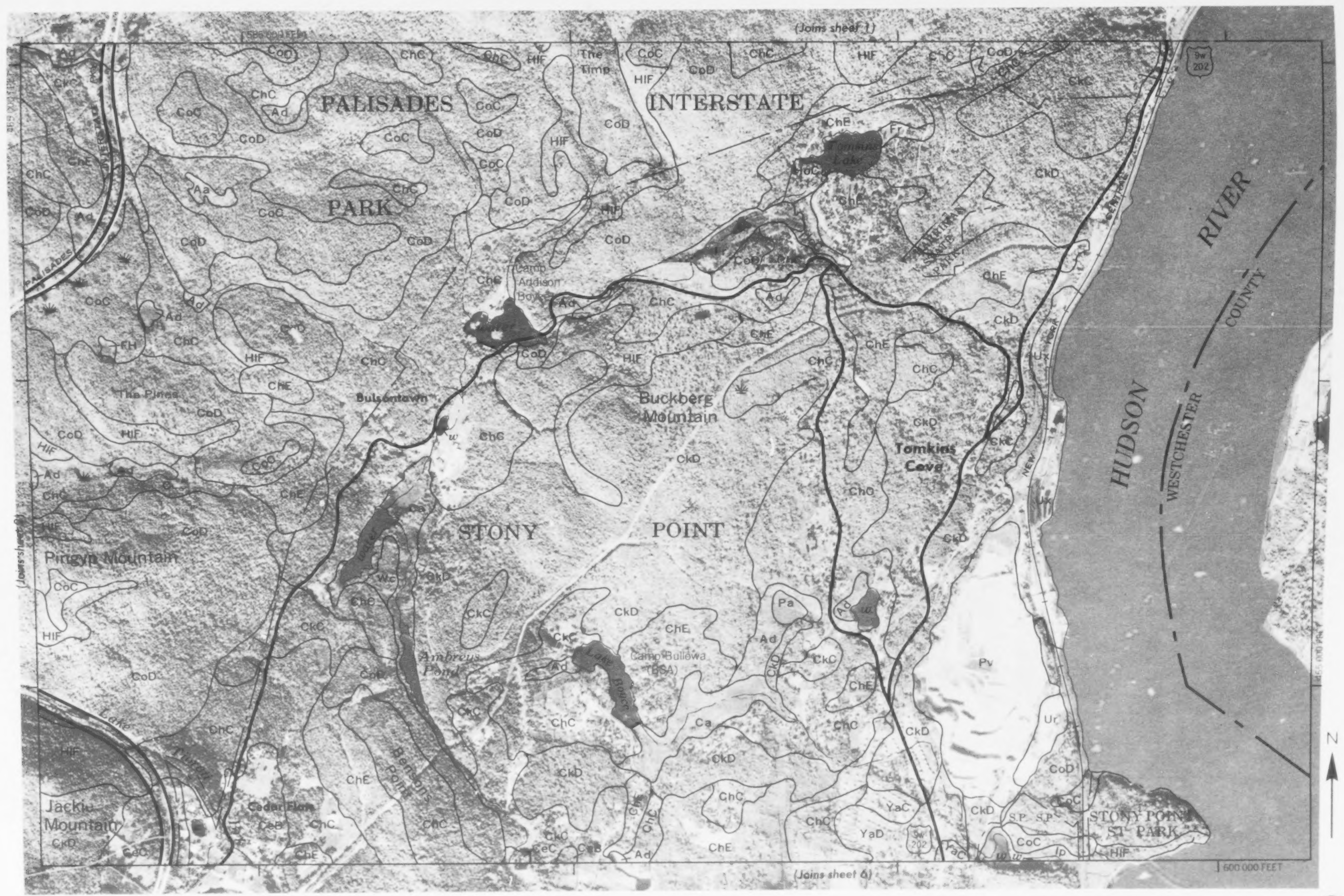

(Joins inset)
(Joins upper right)
4000-FOOT GRID TICKS
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 5)
565 000 FEET
ORANGE COUNTY
STONY POINT
PALISADES INTERSTATE PARK
Flaggy Meadow Mountain
Nat House Mtn
Grape Swamp Mountain
Pound Swamp Mountain
Owl Lake
Stillwater Brook
Lake Tiorati
Grape Swamp
PALISADES INTERSTATE PARKWAY
WELCH LAKE
N

1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

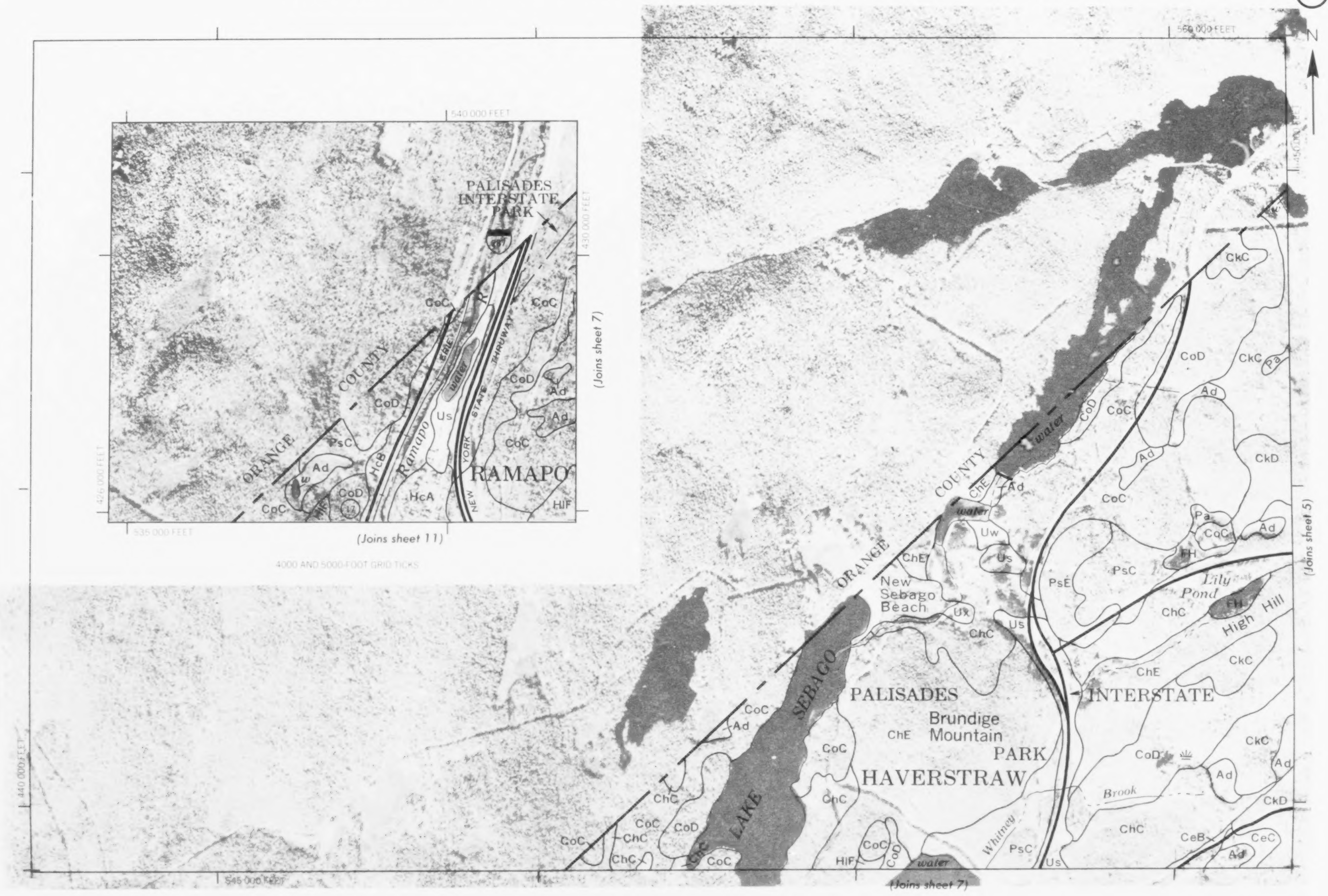
ROCKLAND COUNTY, NEW YORK NO. 3

SCALE 1:24,000
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER


(Joins sheet 1)
(Joins sheet 6)
600 000 FEET
PALISADES INTERSTATE PARK
STONY POINT
HUDSON RIVER
WESTCHESTER COUNTY
Buckberg Mountain
Pingyp Mountain
Jack Mountain
Bulsontown
The Pines
Tomkins Cove
STONY POINT ST. PARK
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 3

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 4 ④


PALISADES INTERSTATE PARK
ORANGE COUNTY
RAMAPO
(Joins sheet 7)
(Joins sheet 11)
4000 AND 5000 FOOT GRID TICKS
ORANGE COUNTY
LAKE SEBAGO
New Sebago Beach
PALISADES
Brundige Mountain
INTERSTATE
PARK
HAVERSTRAW
Lily Pond
High Hill
Whitney
Brook
water
(Joins sheet 5)
(Joins sheet 7)
545 000 FEET
N
CkC
CoD
CoC
CkD
Ad
ChE
ChC
PsC
PsE
Us
Ux
HlF
HcA
CeB
CkE

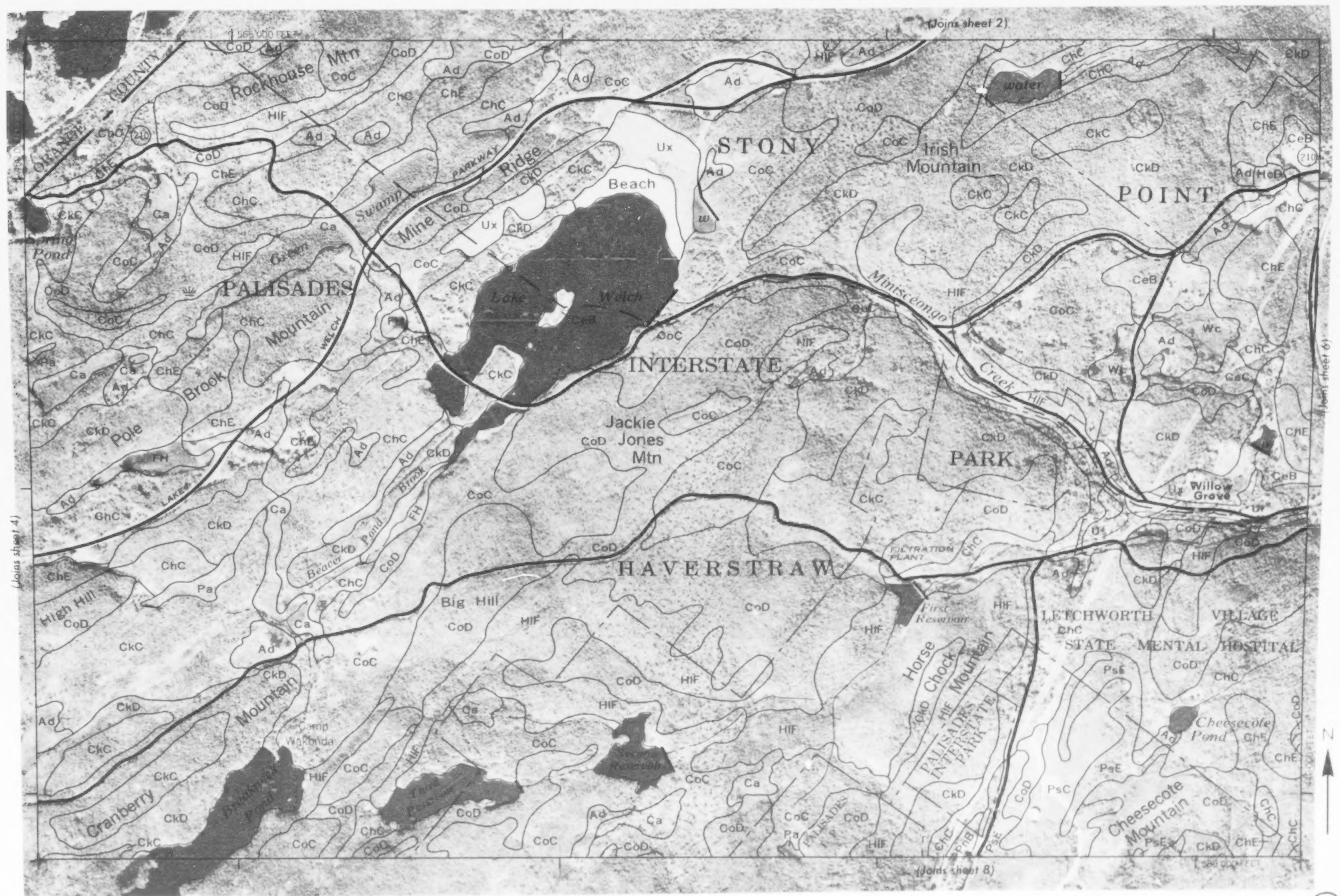
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
Scale 1:24 000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

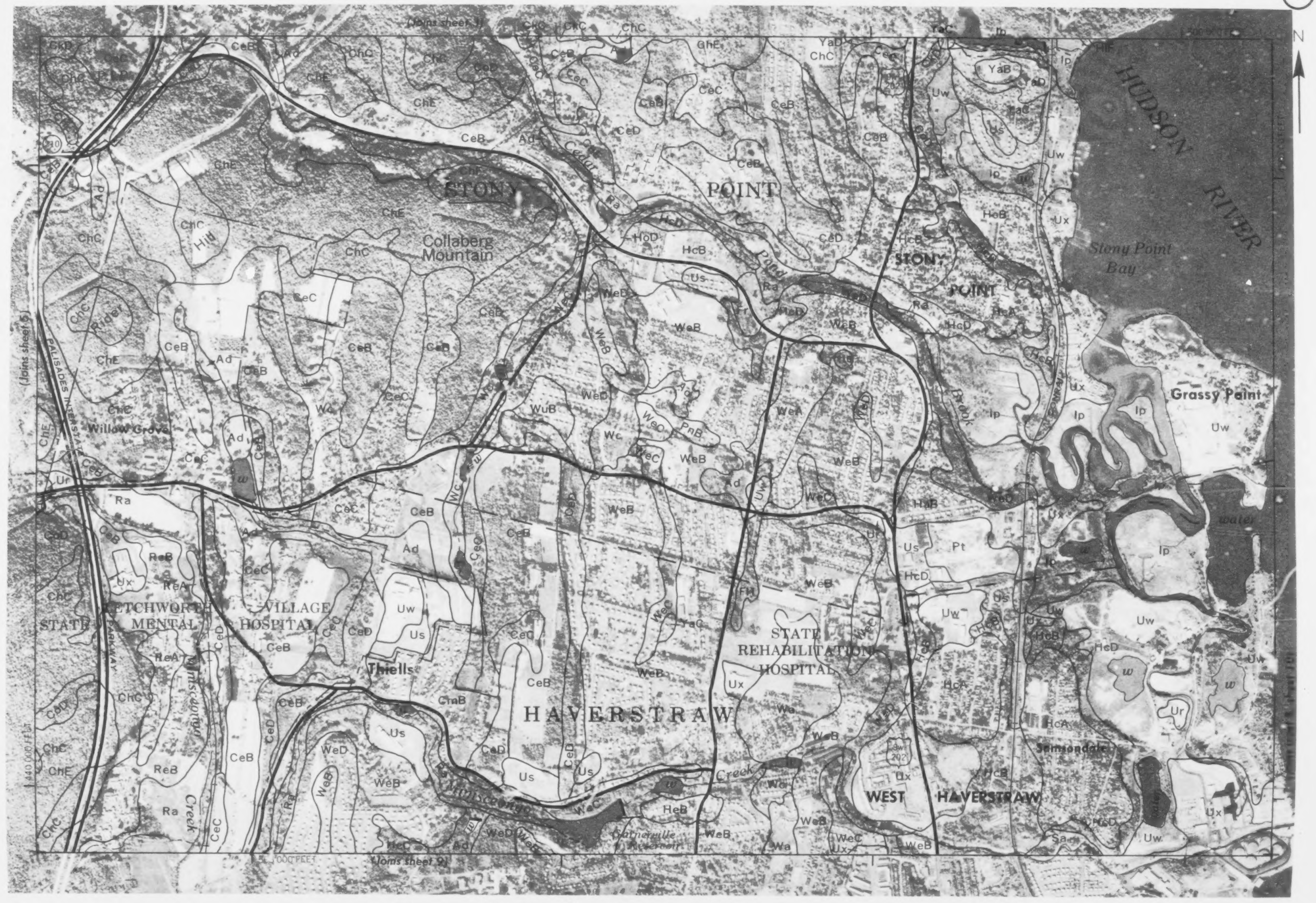
SCALE 1:24 000

1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER


(Joins sheet 2)
ORANGE COUNTY
Rockhouse Mtn
Swamp
Mine
Ridge
Beach
STONY
POINT
Irish Mountain
Lake Welch
PALISADES
Green Mountain
Pole Brook
INTERSTATE
Jackie Jones Mtn
PARK
Minisceongo Creek
Willow Grove
HAVERSTRAW
Big Hill
High Hill
Horse Chock Mountain
PALISADES INTERSTATE PARKWAY
LETCHWORTH VILLAGE STATE MENTAL HOSPITAL
Cheesecote Pond
Cheesecote Mountain
Cranberry
Mountain
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 8)
565 000 FEET
N
CoD
CoC
CkC
CkD
ChC
ChE
Ad
HlF
Ux
Ca
PsC
PsE
CeB
Wc

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 5 ⑤

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 6


HUDSON RIVER
STONY POINT
Collaberg Mountain
Stony Point Bay
Grassy Point
Willow Grove
LETCHWORTH VILLAGE
STATE MENTAL HOSPITAL
Thiells
HAVERSTRAW
STATE REHABILITATION HOSPITAL
WEST HAVERSTRAW
Minisceongo Creek
Garnerville Reservoir
(Joins sheet 9)

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

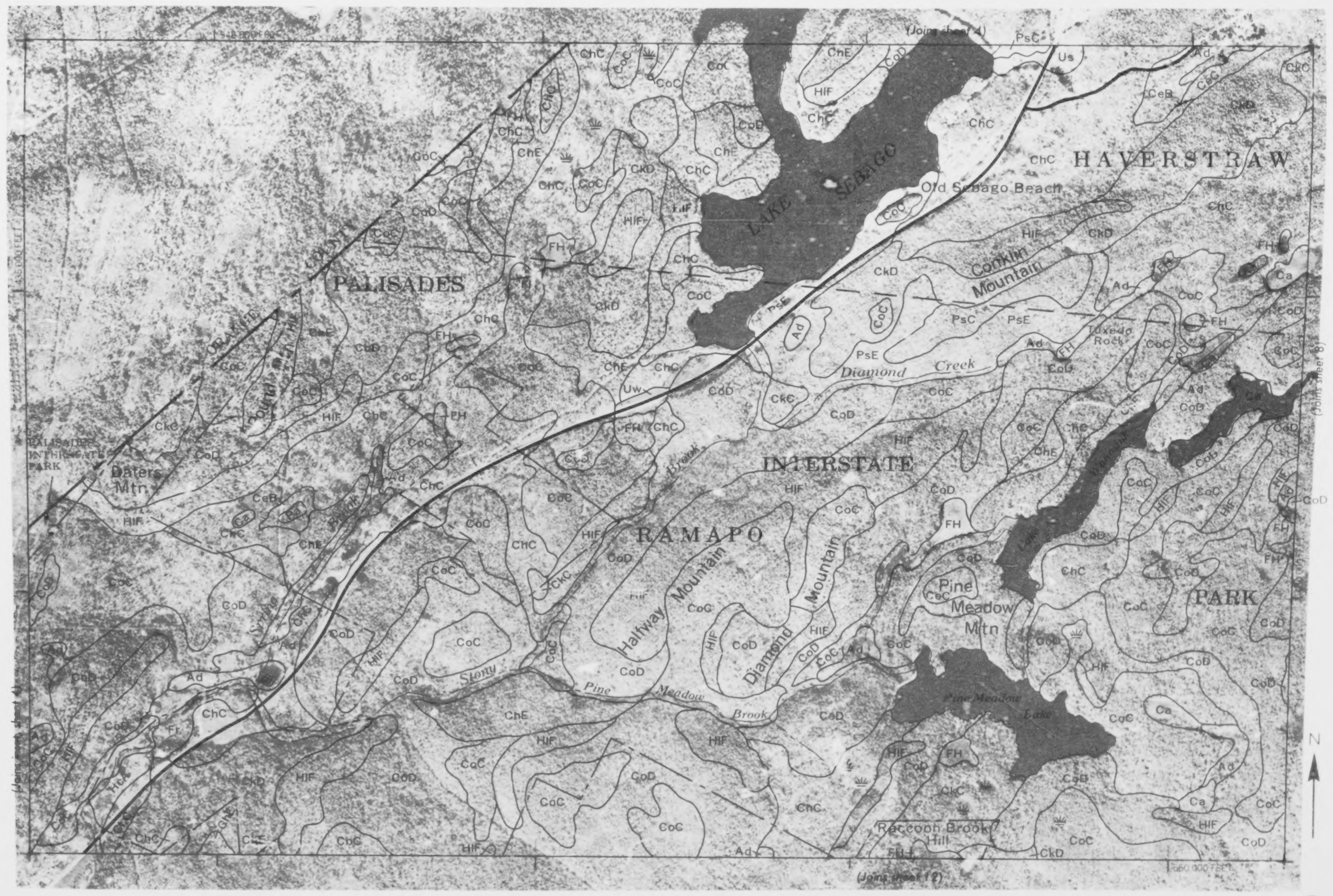
ROCKLAND COUNTY, NEW YORK NO. 6

photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000

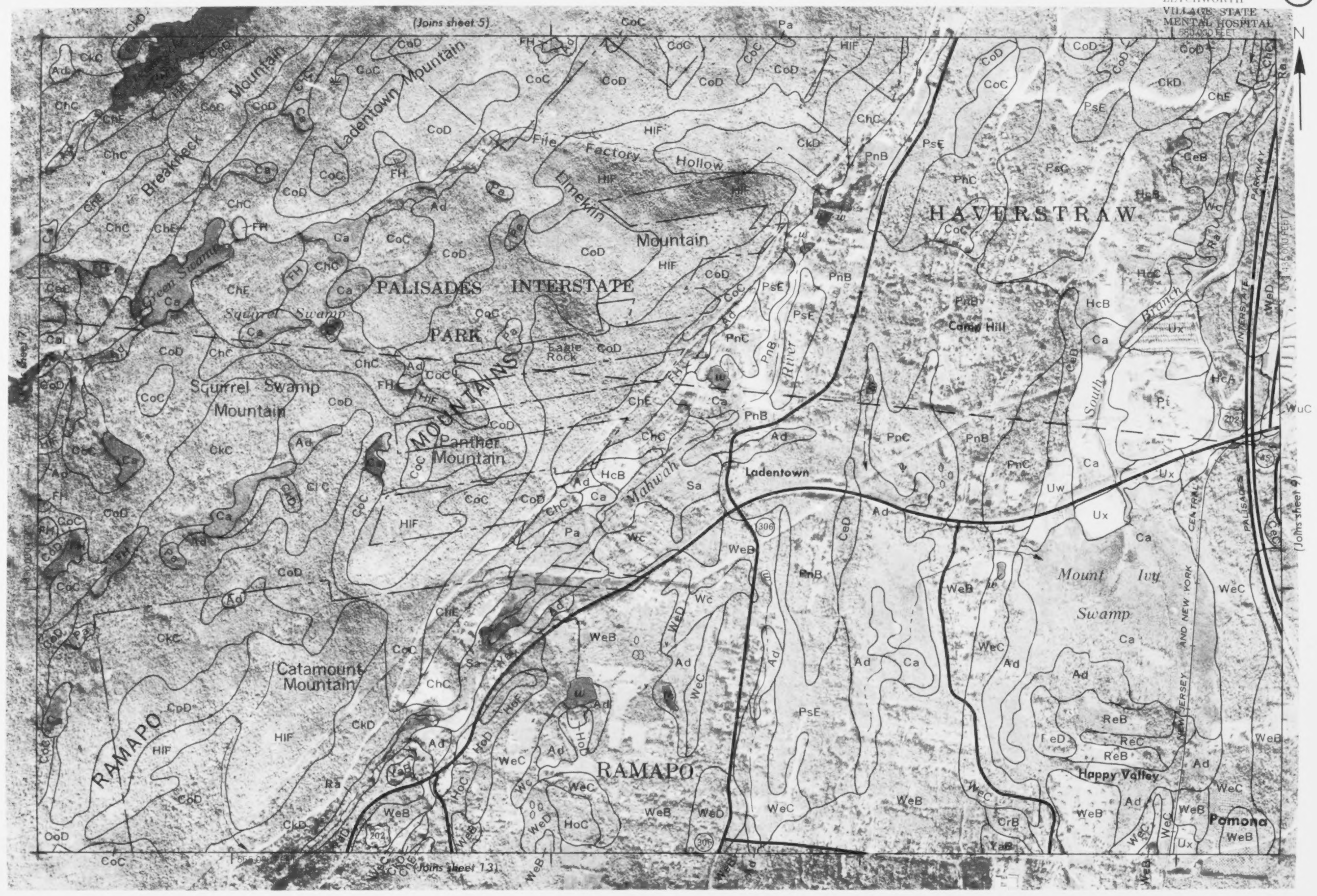
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


(Joins sheet 4)
LAKE SEBAGO
Old Sebago Beach
HAVERSTRAW
Conklin Mountain
PALISADES
Diamond Creek
INTERSTATE
RAMAPO
PARK
Halfway Mountain
Diamond Mountain
Pine Meadow Mtn
Pine Meadow Brook
Raccoon Brook Hill

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 7

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 8 ⑧


LETCHWORTH VILLAGE STATE MENTAL HOSPITAL
(Joins sheet 5)
HAVERSTRAW
PALISADES INTERSTATE PARK
RAMAPO MOUNTAINS
Ladentown Mountain
Limekiln Mountain
Factory Hollow
Squirrel Swamp
Squirrel Swamp Mountain
Panther Mountain
Catamount Mountain
Camp Hill
Ladentown
Mount Ivy Swamp
Happy Valley
Pomona
RAMAPO
(Joins sheet 13)
(Joins sheet 9)
N

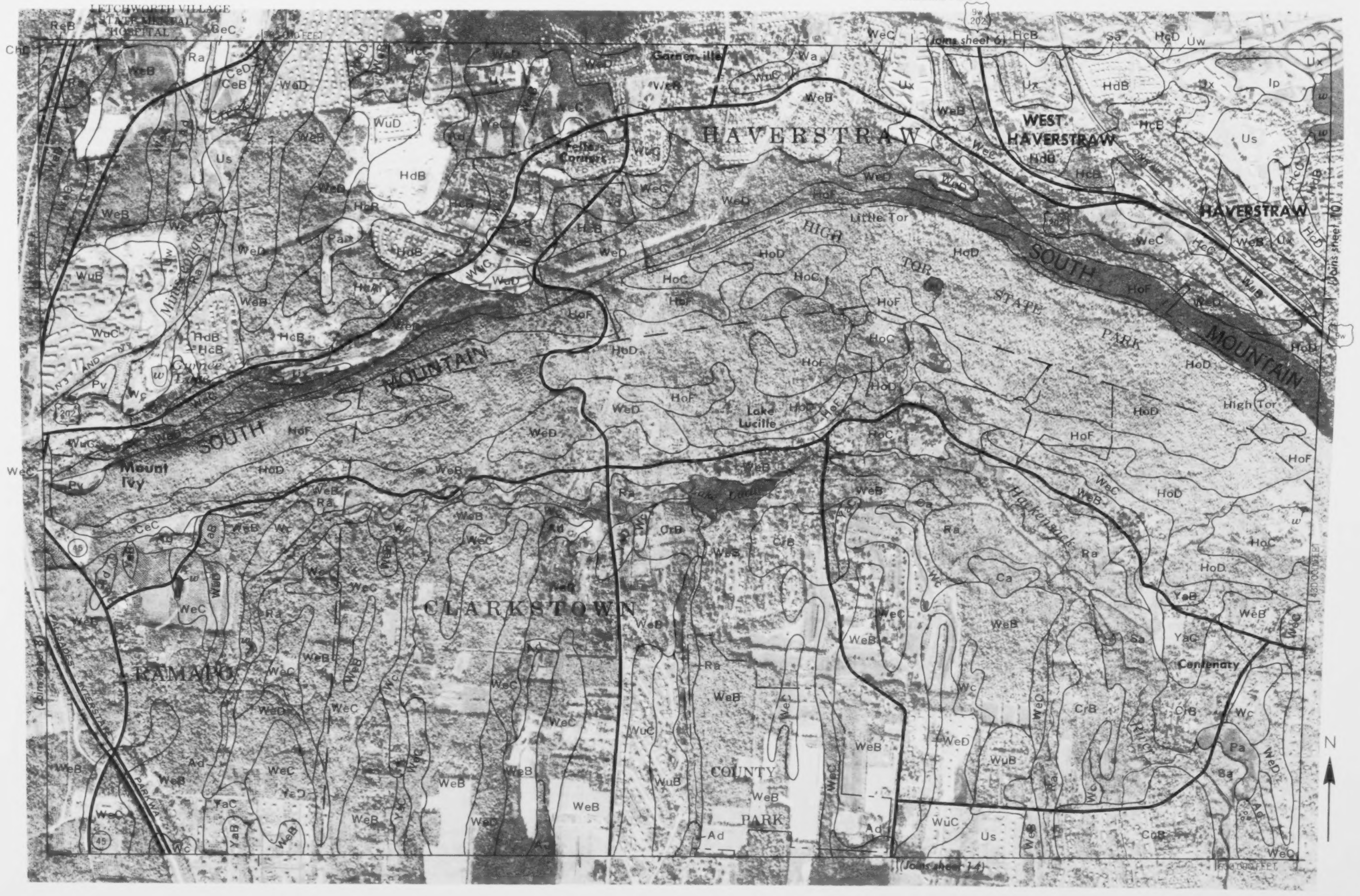
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

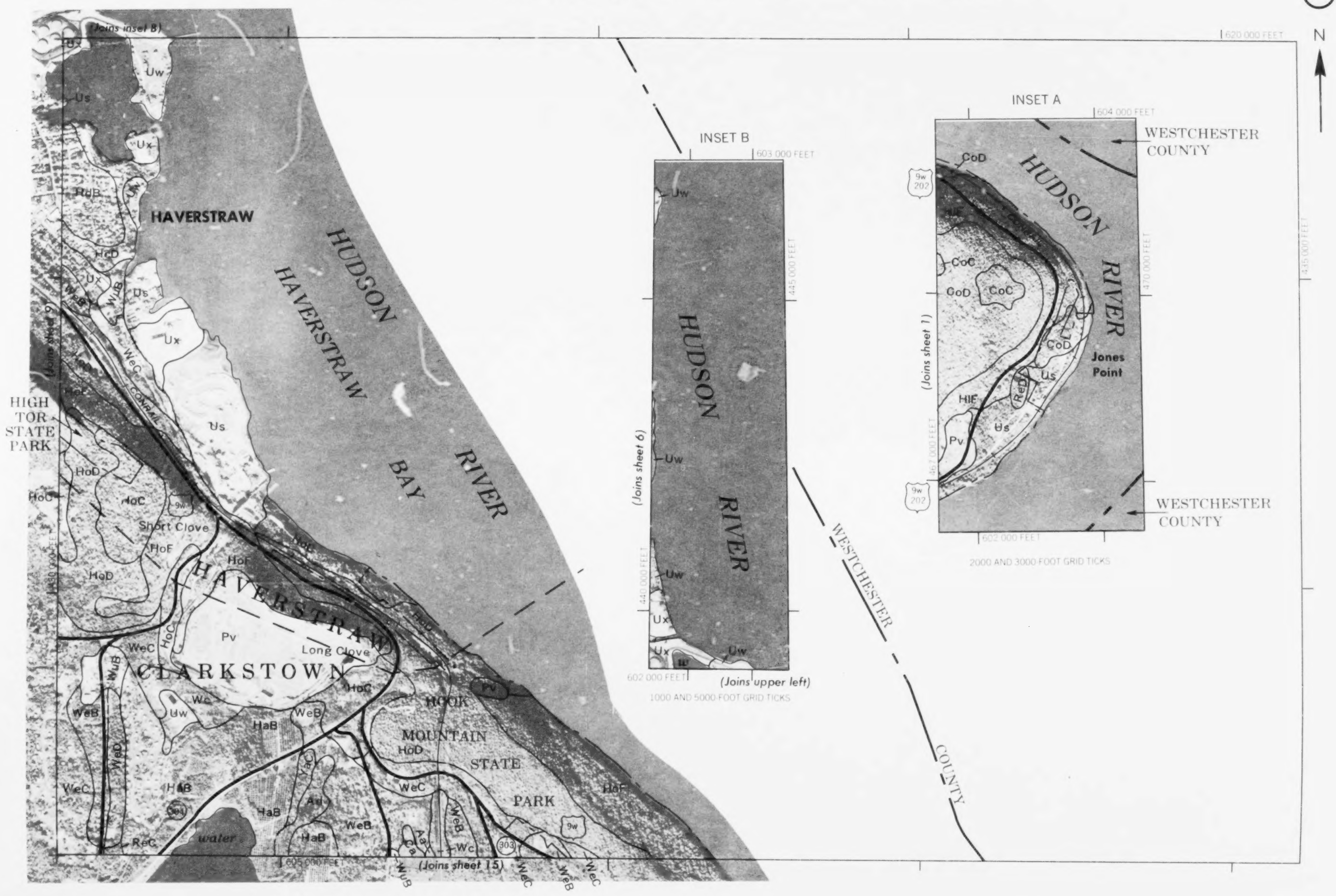
ROCKLAND COUNTY, NEW YORK NO. 8

photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER


LETCHWORTH VILLAGE
(Joins sheet 6)
Garnerville
HAVERSTRAW
WEST HAVERSTRAW
HAVERSTRAW
HIGH TOR STATE PARK
SOUTH MOUNTAIN
High Tor
Little Tor
Lake Lucille
Mount Ivy
CLARKSTOWN
RAMAPO
COUNTY PARK
Centenary
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 9 ⑨


(Joins sheet 8)
HAVERSTRAW
HUDSON RIVER
HAVERSTRAW BAY
HIGH TOR STATE PARK
Short Clove
Long Clove
HAVERSTRAW
CLARKSTOWN
HOOK MOUNTAIN STATE PARK
water
(Joins sheet 15)
605 000 FEET
INSET B
(Joins sheet 6)
(Joins upper left)
1000 AND 5000 FOOT GRID TICKS
INSET A
WESTCHESTER COUNTY
Jones Point
(Joins sheet 1)
2000 AND 3000 FOOT GRID TICKS
WESTCHESTER COUNTY
N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

Scale 1:24,000

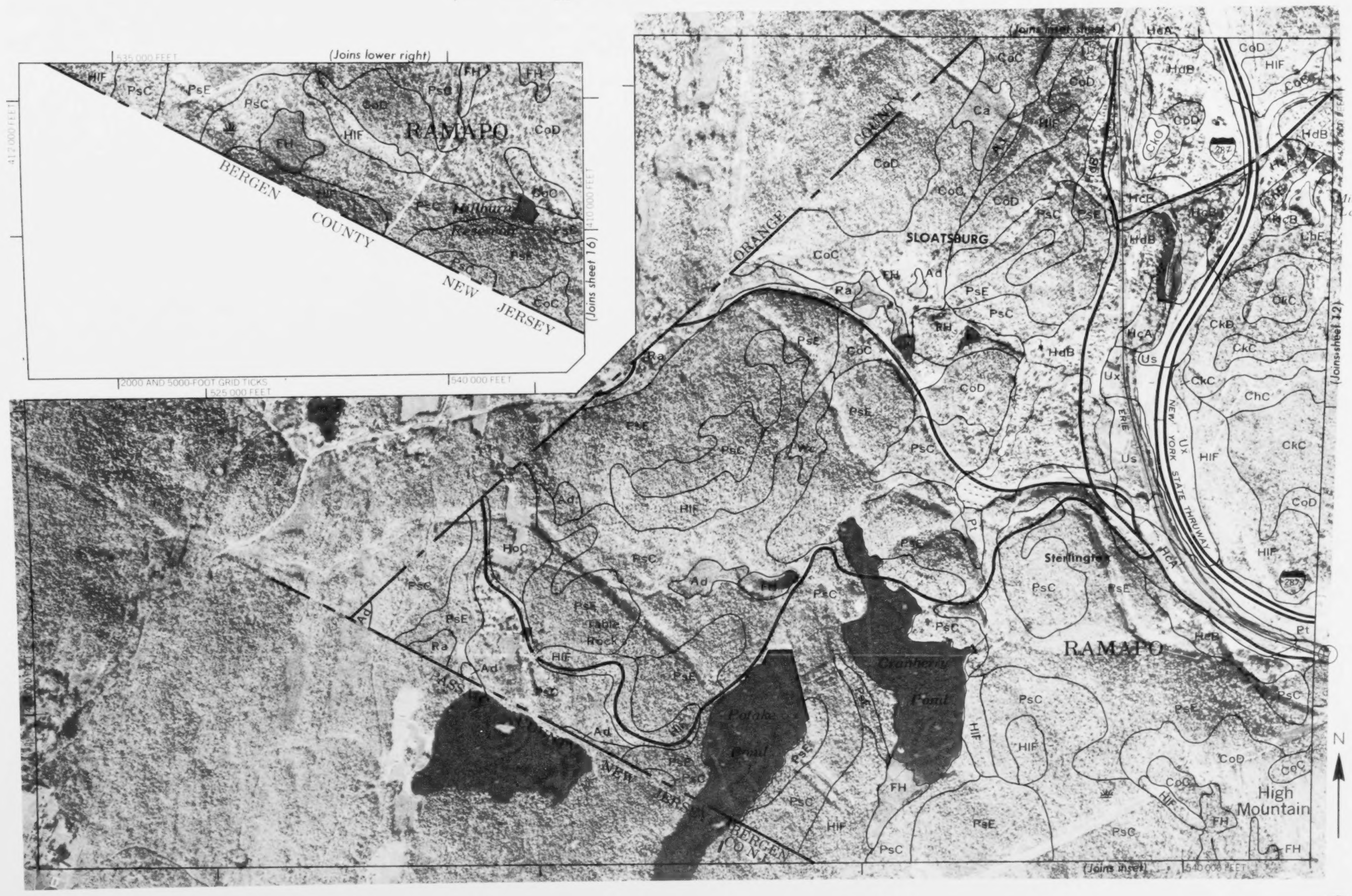
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

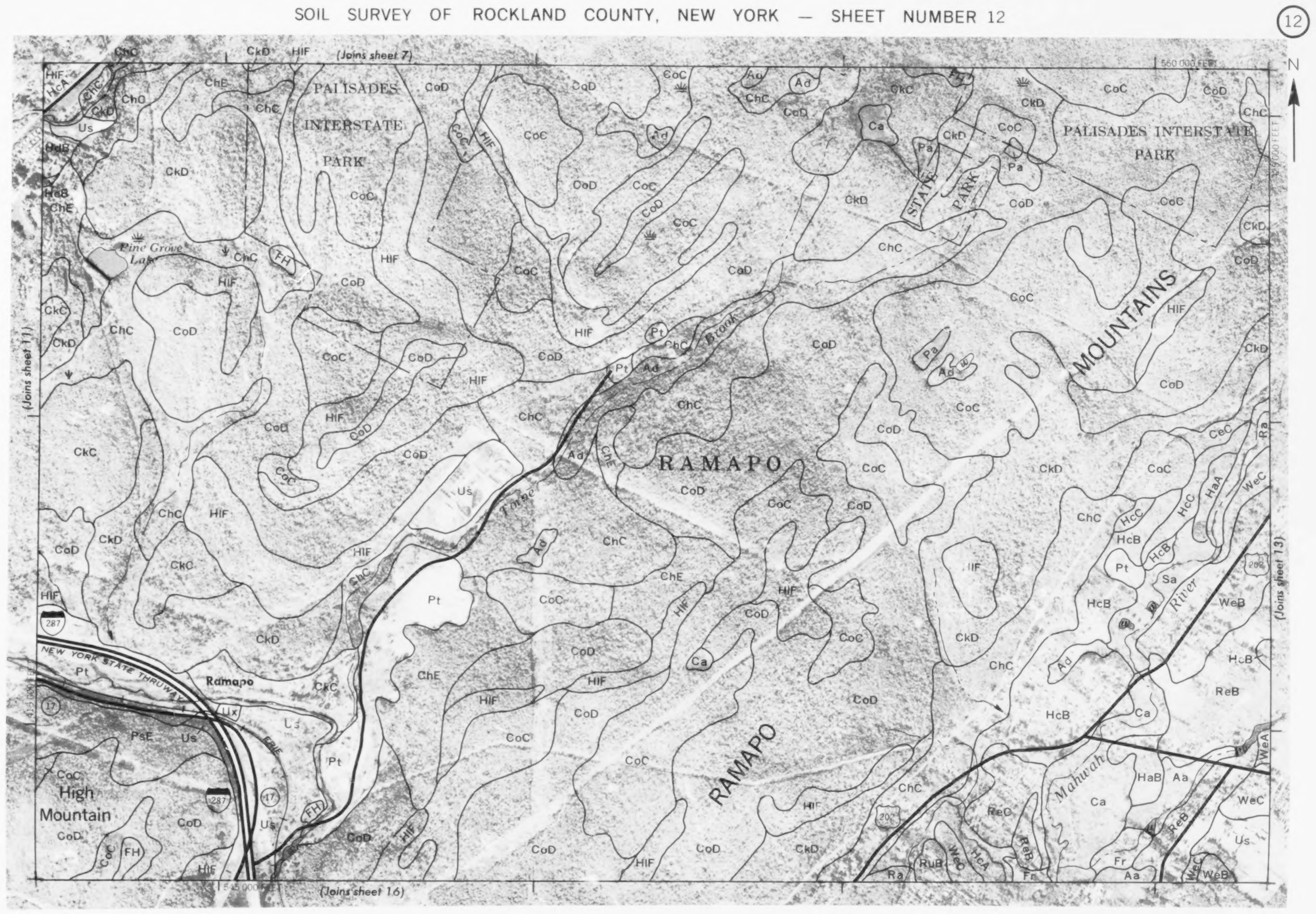
SCALE 1:24,000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


(Joins lower right)
RAMAPO
BERGEN COUNTY
NEW JERSEY
(Joins sheet 16)
2000 AND 5000 FOOT GRID TICKS
ORANGE COUNTY
SLOATSBURG
Sterlington
RAMAPO
High Mountain
(Joins sheet 12)
(Joins inset)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 12 ⑫


(Joins sheet 7)
PALISADES INTERSTATE PARK
Pine Grove Lake
STATE PARK
PALISADES INTERSTATE PARK
MOUNTAINS
RAMAPO
RAMAPO
Ramapo
NEW YORK STATE THRUWAY
High Mountain
Mahwah River
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 16)
N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

Scale 1:24,000

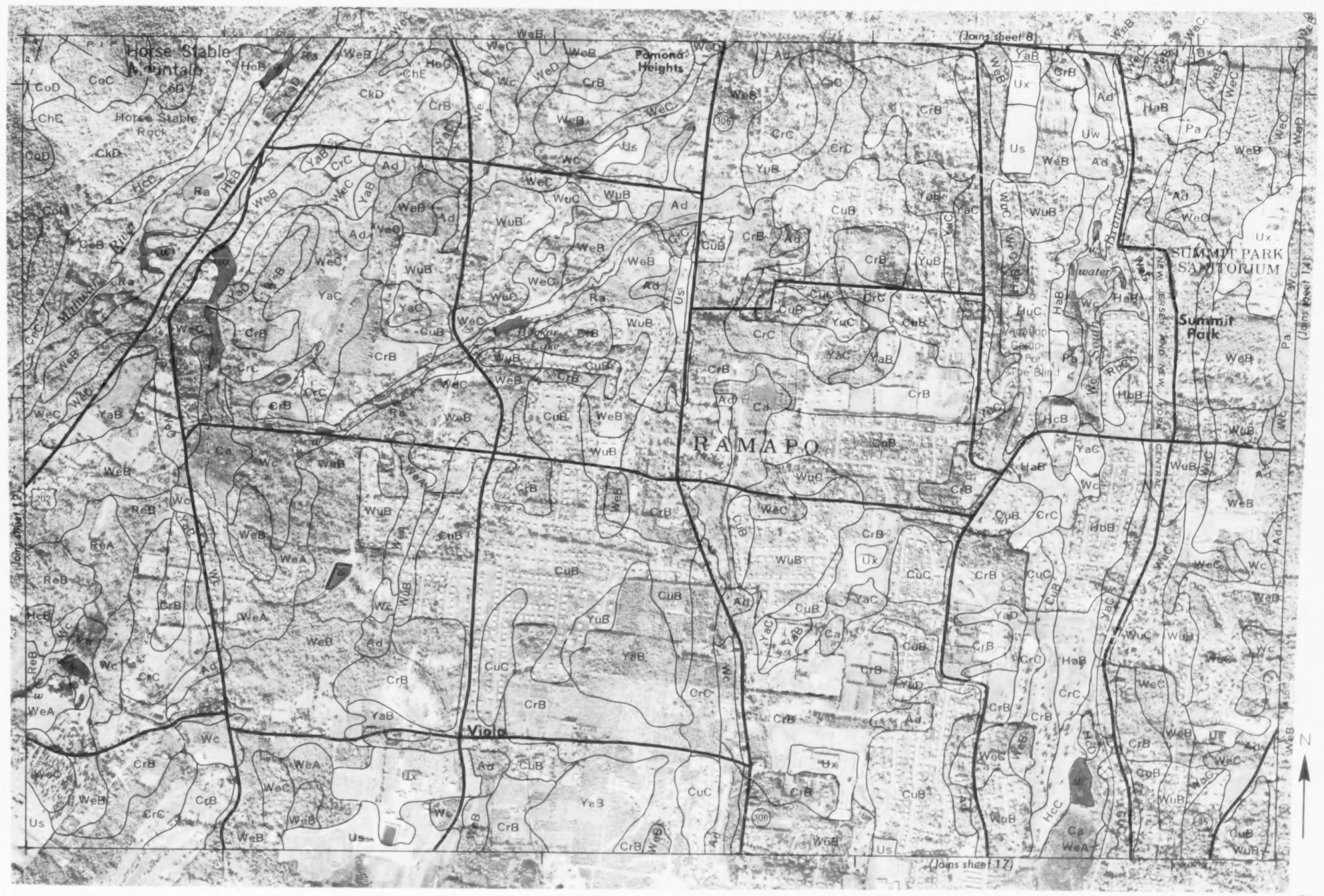
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

ROCKLAND COUNTY, NEW YORK NO. 12

SCALE 1:24,000

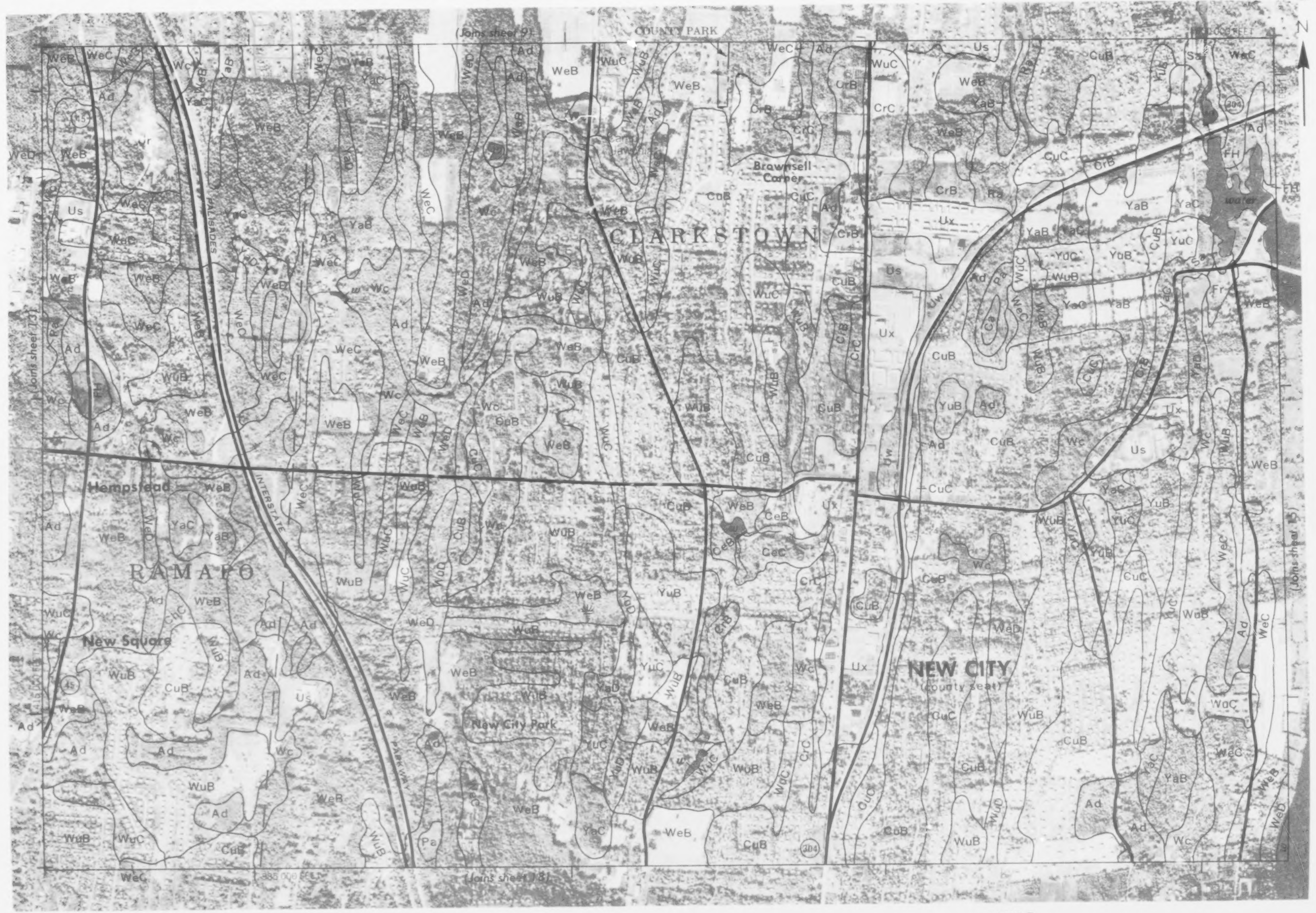
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


Horse Stable Mountain
Horse Stable Rock
Pomona Heights
(Joins sheet 8)
SUMMIT PARK SANATORIUM
Summit Park
RAMAPO
Viola
(Joins sheet 13)
(Joins sheet 17)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 13 ⑬

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 14 ⑭


N
CLARKSTOWN
RAMAPO
NEW CITY
Hempstead
New Square
Brownell Corner
New City Park
(Joins sheet 18)

Scale 1:24,000

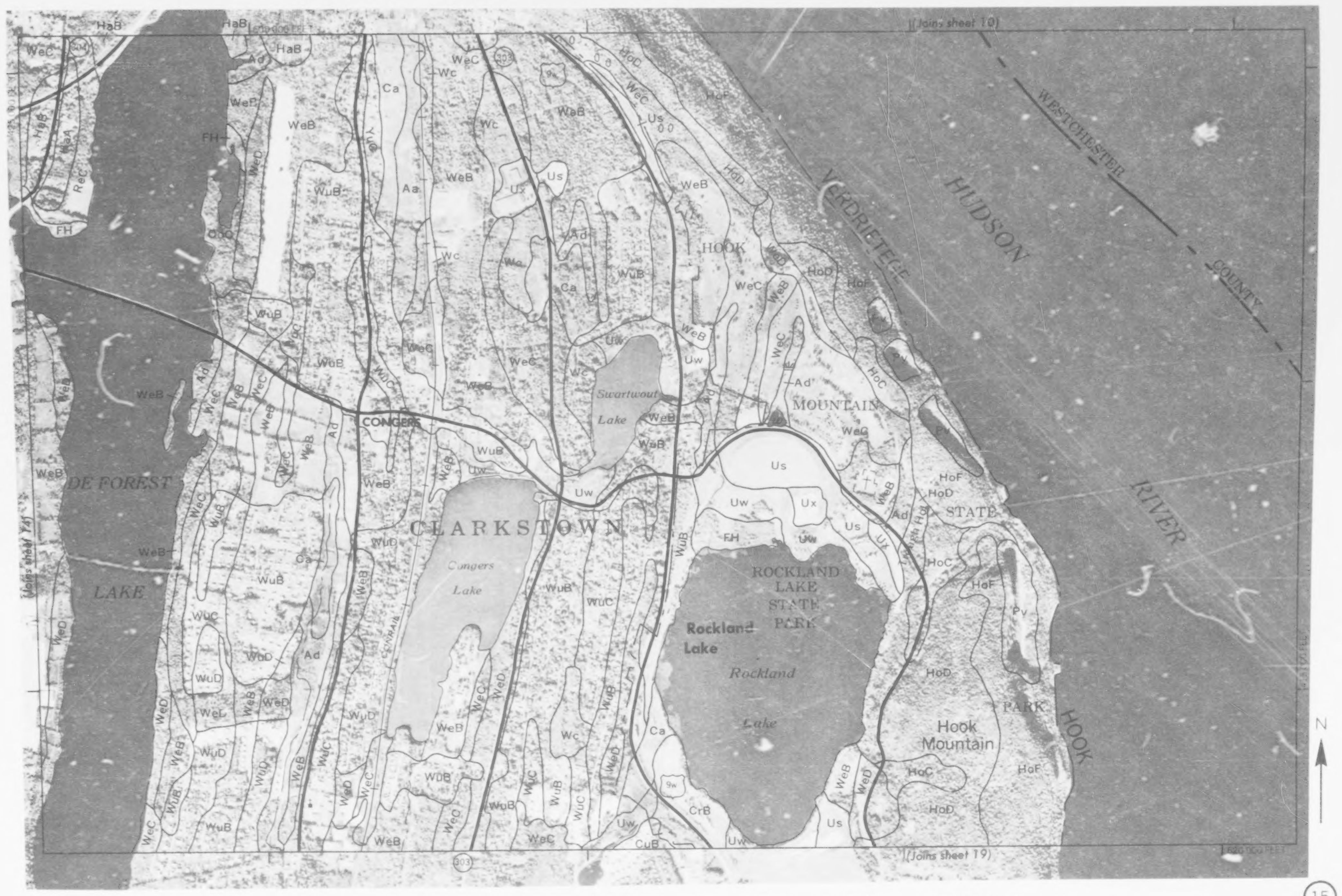
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

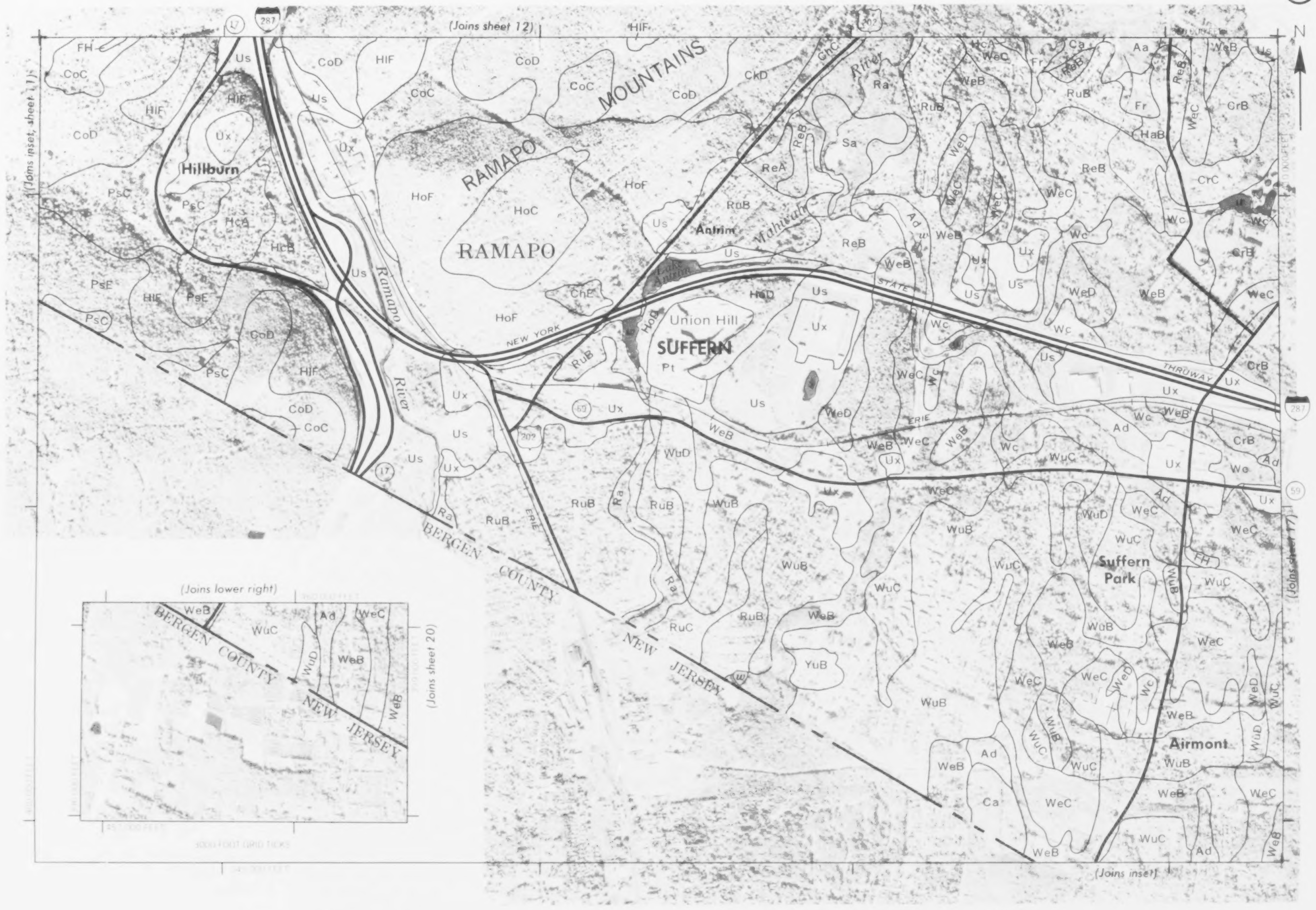
SCALE 1:24,000

1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER


(Joins sheet 10)
HUDSON
RIVER
WESTCHESTER COUNTY
DE FOREST
LAKE
CLARKSTOWN
CONGERS
Swartout Lake
Congers Lake
Rockland Lake
ROCKLAND LAKE STATE PARK
HOOK MOUNTAIN STATE PARK
Hook Mountain
N
(Joins sheet 19)

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 15 ⑮

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 16 ⑯

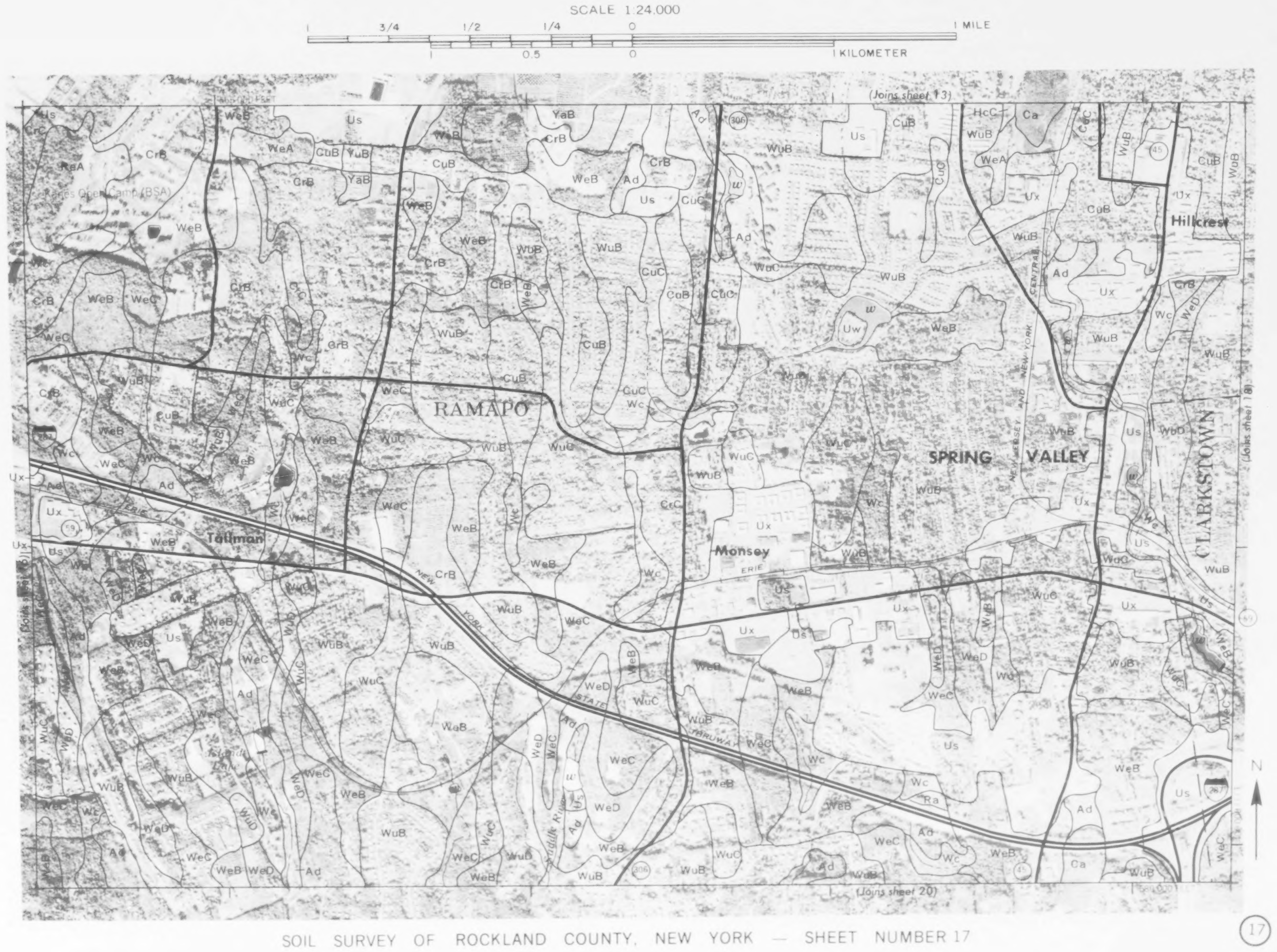

(Joins sheet 12)
(Joins inset, sheet 11)
RAMAPO MOUNTAINS
RAMAPO
Hillburn
Ramapo River
Mahwah River
Union Hill
SUFFERN
Suffern Park
Airmont
BERGEN COUNTY NEW JERSEY
(Joins lower right)
(Joins sheet 20)
(Joins inset)
3000 FOOT GRID TICKS
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER

Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

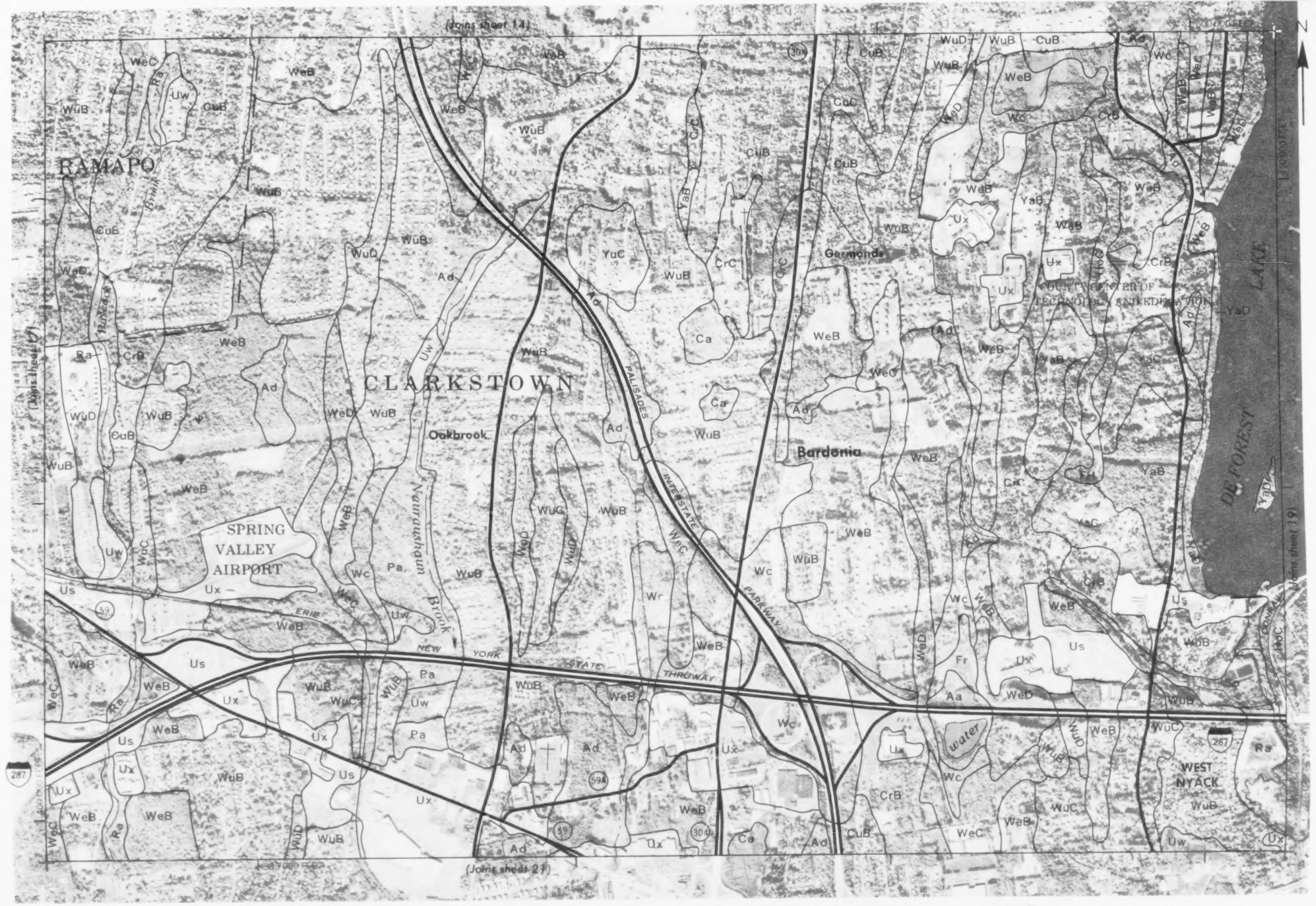
photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000


1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
(Joins sheet 13)
RAMAPO
Tallman
Monsey
SPRING VALLEY
Hillcrest
CLARKSTOWN
(Joins sheet 18)
(Joins sheet 20)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 17 ⑰

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 18 ⑱


(Joins sheet 14)
RAMAPO
CLARKSTOWN
Oakbrook
SPRING VALLEY AIRPORT
Germonds
Bardonia
DE FOREST LAKE
WEST NYACK
(Joins sheet 21)
(Joins sheet 19)
(Joins sheet 17)
N

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

Scale 1:24,000

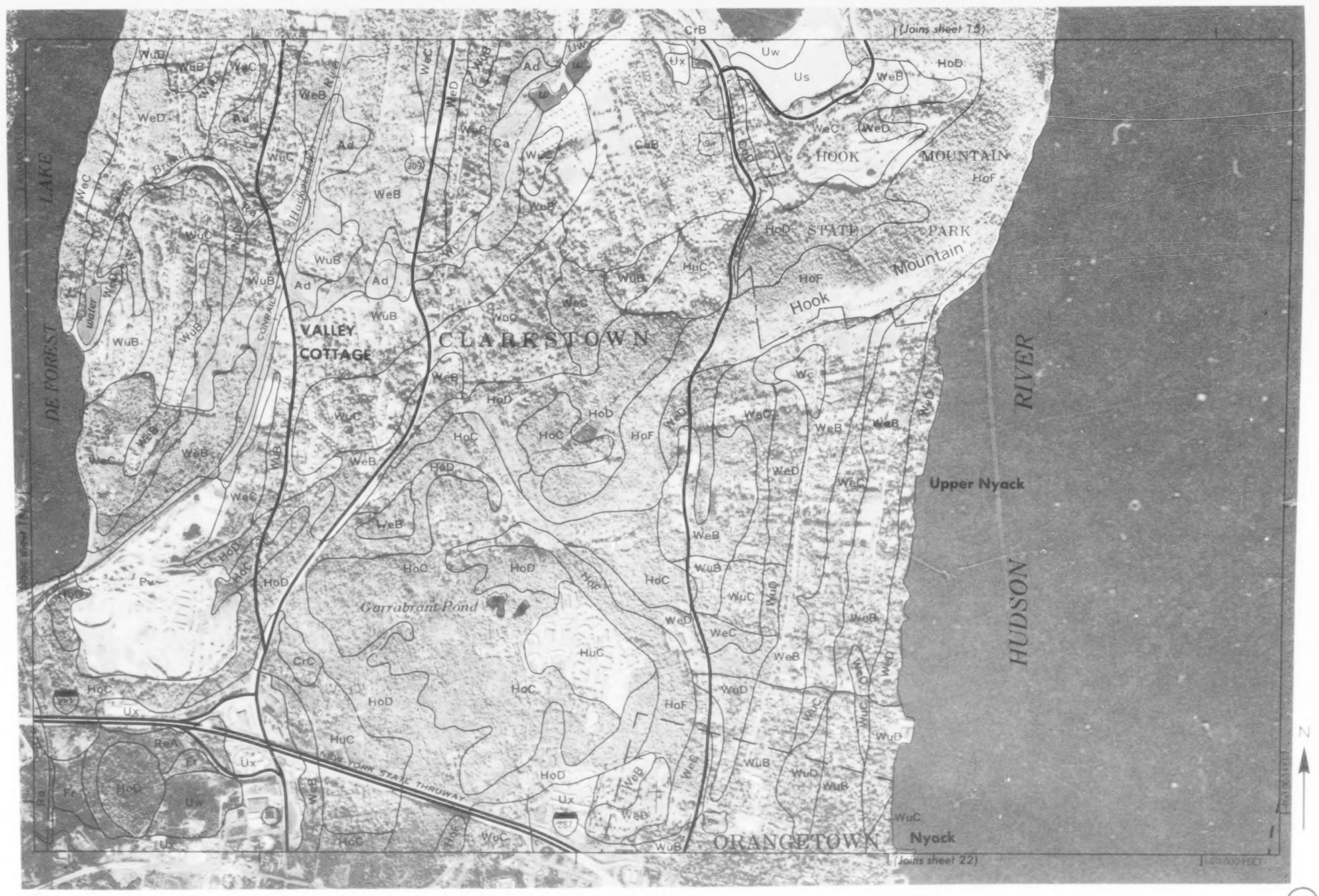
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000

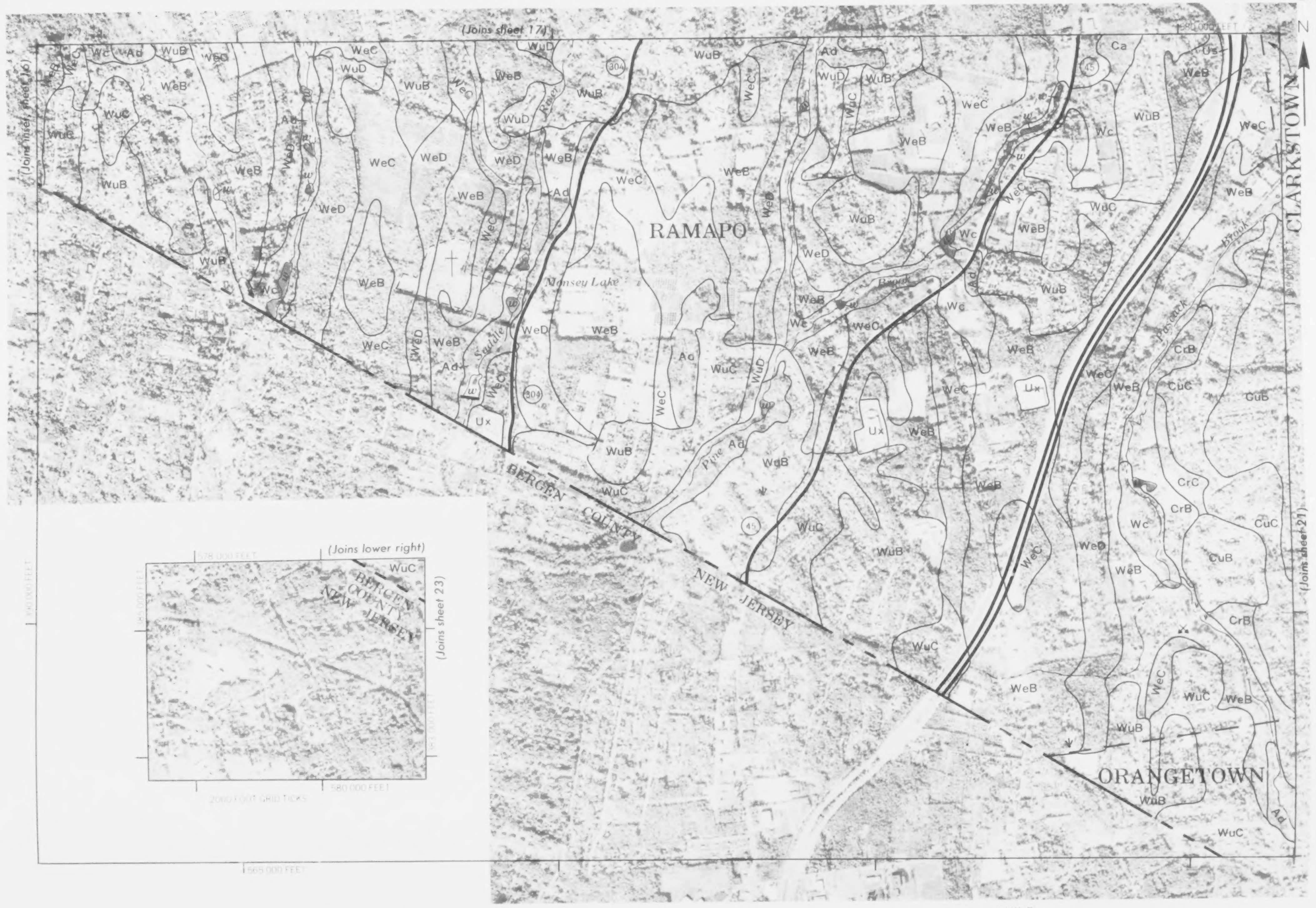
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


(Joins sheet 15)
DE FOREST LAKE
VALLEY COTTAGE
CLARKSTOWN
HOOK MOUNTAIN STATE PARK
Hook Mountain
Garrabrant Pond
Upper Nyack
HUDSON RIVER
ORANGETOWN
Nyack
(Joins sheet 22)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 19 ⑲

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 20 ⑳


(Joins sheet 17)
RAMAPO
CLARKSTOWN
ORANGETOWN
BERGEN COUNTY
NEW JERSEY
(Joins sheet 21)
(Joins lower right)
(Joins sheet 23)
2000 FOOT GRID TICKS
580 000 FEET
565 000 FEET
WeB
WeC
WeD
WuB
WuC
WuD
Ad
Ca
CrB
CrC
CuB
CuC
Ux

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

Scale 1:24,000

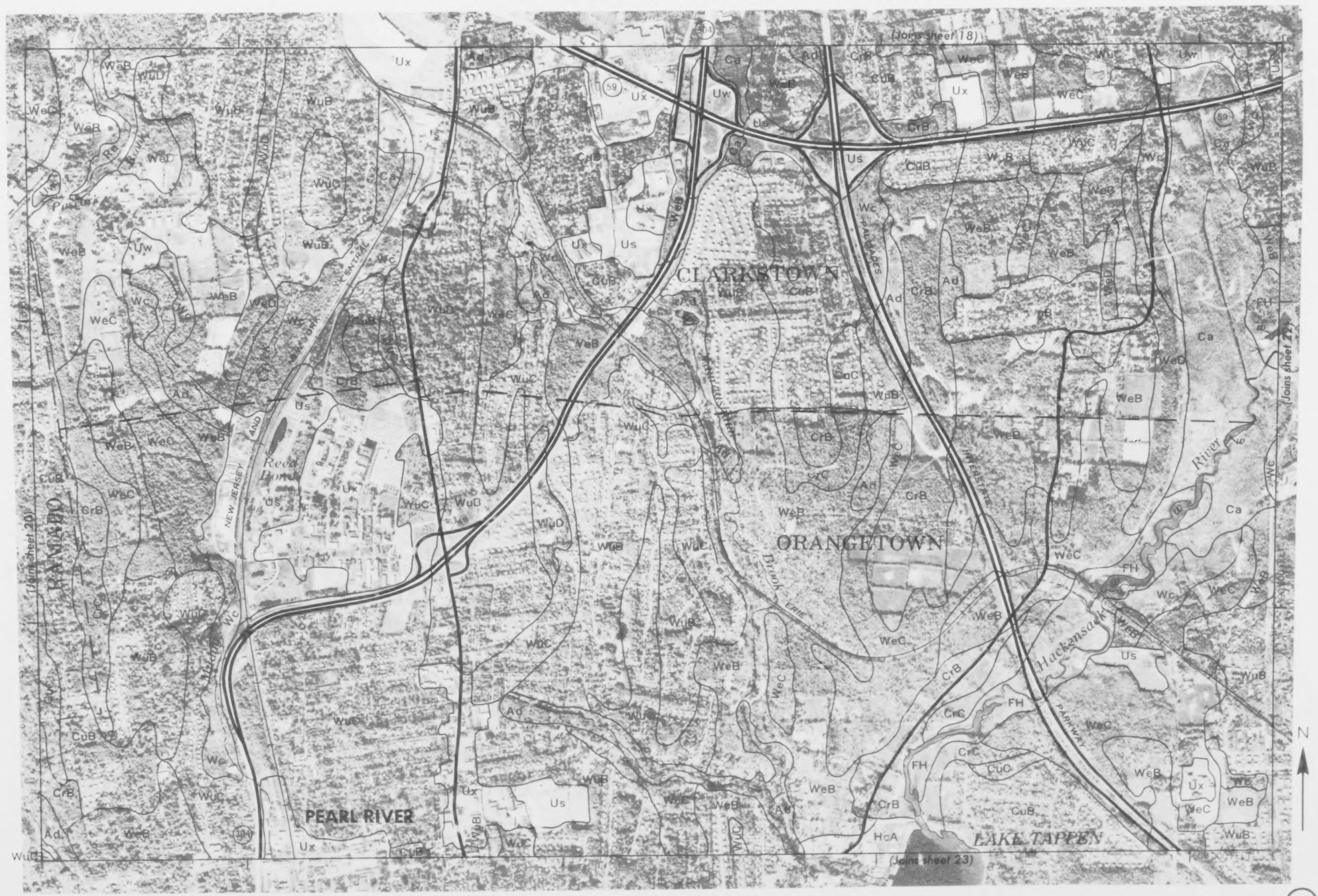
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000

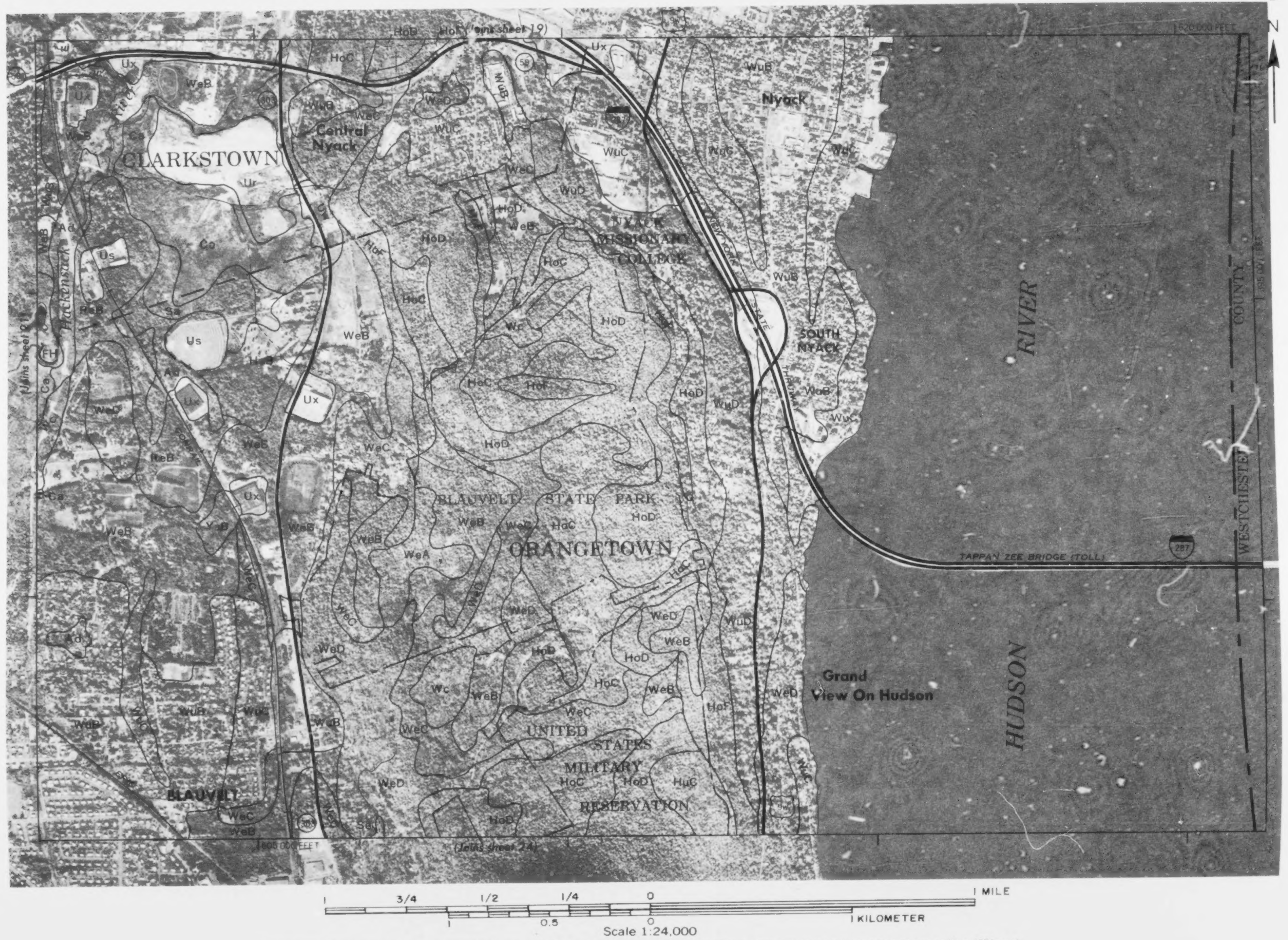
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER


(Joins sheet 18)
CLARKSTOWN
ORANGETOWN
RAMAPO
PEARL RIVER
LAKE TAPPEN
(Joins sheet 20)
(Joins sheet 23)
59
304
Ux
Uw
Us
Ad
Ca
CrB
CuB
WeB
WeC
WeD
WuB
WuC
FH
HcA

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 21 ㉑

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 22

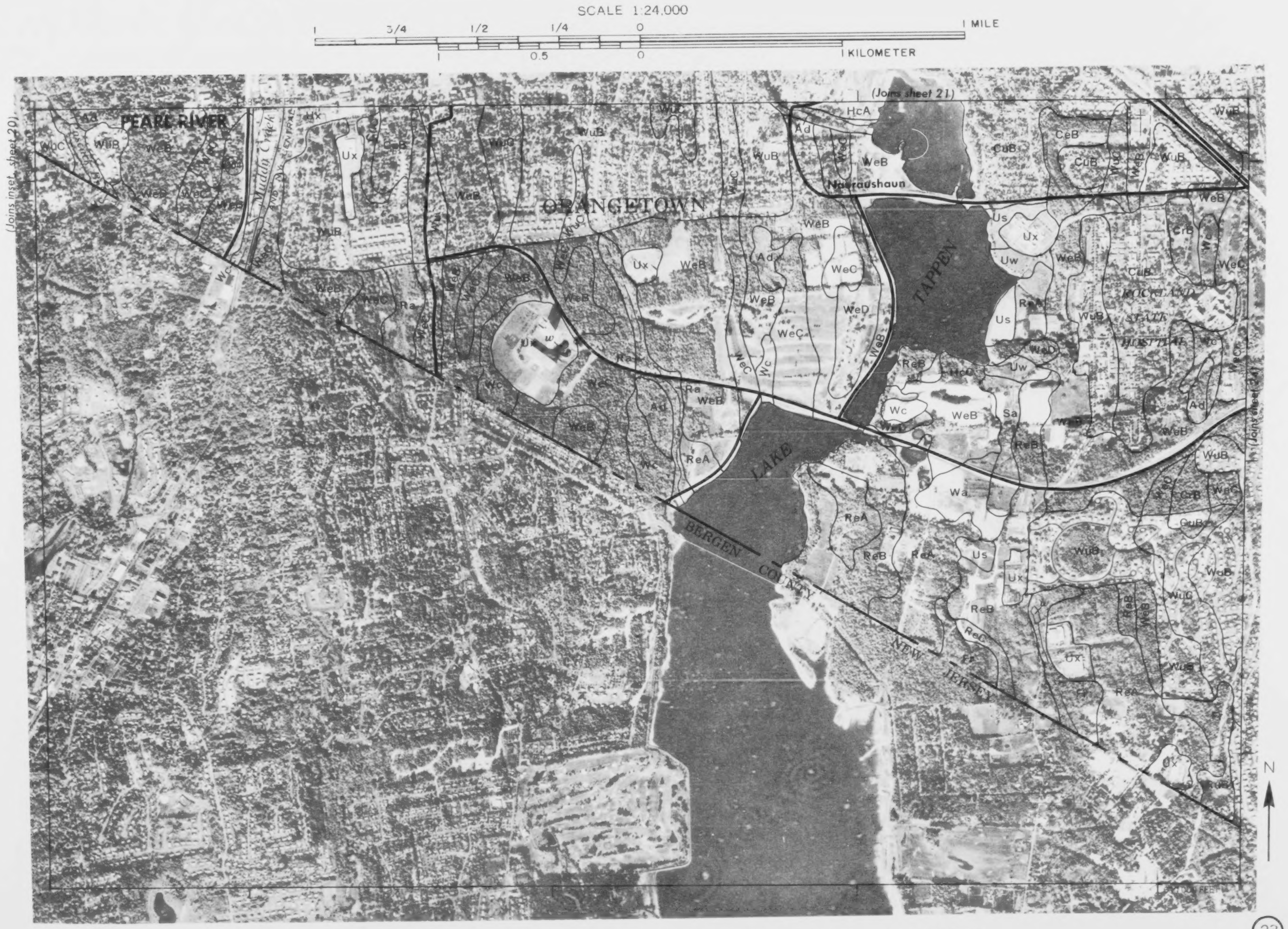

(Joins sheet 19)
CLARKSTOWN
Central Nyack
Nyack
MISSIONARY COLLEGE
SOUTH NYACK
BLAUVELT STATE PARK
ORANGETOWN
Grand View On Hudson
UNITED STATES MILITARY RESERVATION
BLAUVELT
RIVER
HUDSON
TAPPAN ZEE BRIDGE (TOLL)
WESTCHESTER
(Joins sheet 24)
N
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5

Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

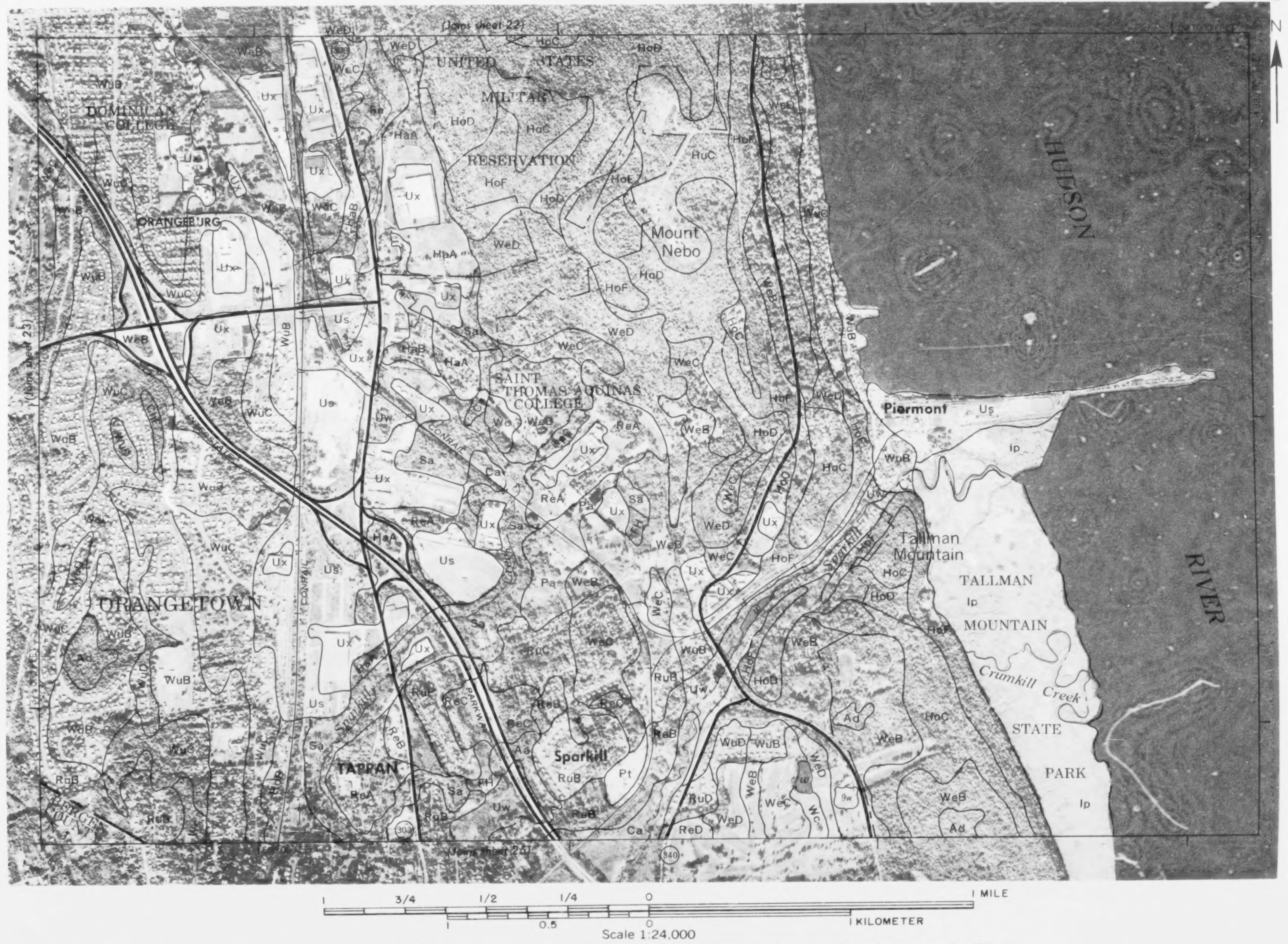
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000


1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
(Joins sheet 21)
PEARL RIVER
ORANGETOWN
Nauraushaun
TAPPAN
LAKE
(Joins sheet 20)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 23

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 24 ㉔

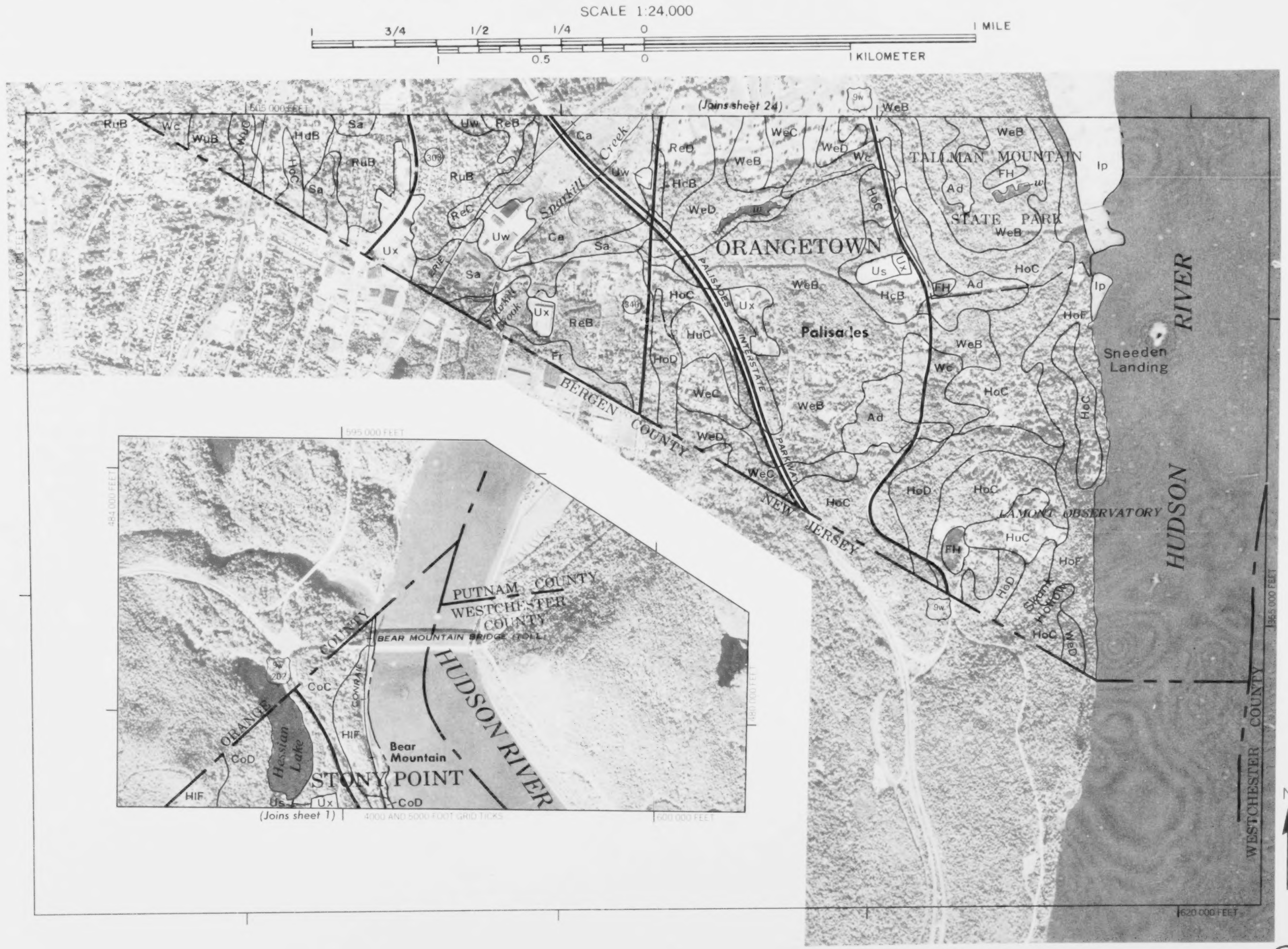

(Joins sheet 22)
UNITED STATES MILITARY RESERVATION
DOMINICAN COLLEGE
ORANGEBURG
Mount Nebo
SAINT THOMAS AQUINAS COLLEGE
Piermont
HUDSON RIVER
Tallman Mountain
TALLMAN MOUNTAIN STATE PARK
Crumkill Creek
ORANGETOWN
TAPPAN
Sparkill
(Joins sheet 25)
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER

Scale 1:24,000

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are controlled photomosaics prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SCALE 1:24,000


1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
(Joins sheet 24)
TALLMAN MOUNTAIN STATE PARK
ORANGETOWN
Sparkill Creek
Palisades
BERGEN COUNTY NEW JERSEY
Sneeden Landing
LAMONT OBSERVATORY
HUDSON RIVER
WESTCHESTER COUNTY
PUTNAM COUNTY
WESTCHESTER COUNTY
BEAR MOUNTAIN BRIDGE
HUDSON RIVER
Bear Mountain
Hessian Lake
STONY POINT
ORANGE COUNTY
(Joins sheet 1)
N

SOIL SURVEY OF ROCKLAND COUNTY, NEW YORK — SHEET NUMBER 25 ㉕